OPERATOR - MAINTENANCE
INSTRUCTION MANUAL/TM-0210-9

S-4035-0031

FOR ALL UNITS WITH SERIAL NO. PREFIX "E"

SR-206, SR-210
HF SSB TRANSCEIVER

MAY 1975

SR SYSTEMS

SCIENTIFIC RADIO SYSTEMS INC.
367 ORCHARD STREET
ROCHESTER, NEW YORK U.S.A.

Tubes - 12BY7 (V2)
12DZ6 (V1)

PA Tubes - 6146B (V1, V2, V3)

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PREFACE

The SR-206/210 HF SSB Transceiver is an extremely versatile radio, offering many standard and special options. There are many different main frame wiring schemes, depending on front panel controls, rear panel connectors, and whether or not remote control is required. There are also several variations in the types of modules and pc boards which plug into the main frame. This versatility allows the customer to order units tailored to his special application.

Instruction Manual coverage of the numerous variations can cause confusion to the reader. Therefore we have done several things to alleviate the situation as much as possible.

1. The manual is arranged for easy information access. Each chapter covers a specific assembly or task. The chapterization of the manual is based on this radio, not on customary arrangement. The Table of Contents and Maintenance Procedures Index will help you find specific material by topic. The headings along the page tops will also speed indexing of the correct chapter.

2. Much confusion resulting from variations is eliminated by custom-binding of each manual. Sections which do not apply may be deleted and additional material may be added to the manual for each order. Special addenda may be bound in the last section of the manual for optional assemblies. Records are maintained in a special library at the plant to allow us to determine what information applies to each radio.

3. Schematic diagrams, such as those for the main frame assembly, which are highly changeable are drawn in sections on page-size sheets. This allows several standard versions to be maintained for various types of sets, and it allows special radios and systems to be custom documented when required. Thus, you receive specific information for your particular set, even with special order requirements.*

4. Each radio is shipped with a tag indicating the order number, serial number, channel and if frequencies, and standard options supplied. The information on the tag is extremely valuable later in the life of the equipment. The information should be recorded for safekeeping or the tags should be filed or fastened inside the radio covers to ensure that you have the information when required.

* NOTE:

Following are the four general types of main frames:

Type I - Regular, simplex, full mode selection, non-remote
Type II - As above, but remote
Type III - Marine, duplex, programmed modes, remote
Type IV - As above, but non-remote

WARNING

VOLTAGES DANGEROUS TO LIFE EXIST WITHIN THIS EQUIPMENT. ONLY QUALIFIED TECHNICIANS SHOULD BE AUTHORIZED FOR REPAIR OR ALIGNMENT.

AT INSTALLATION, ENSURE THAT THE EQUIPMENT IS PROPERLY CONNECTED TO EARTH GROUND (WATER PIPE OR SIMILAR GROUND BUS).

EVEN WITH ONLY TOP AND BOTTOM COVERS REMOVED, DANGEROUS VOLTAGES EXIST. IN CERTAIN STAGES OF DISASSEMBLY, HIGH VOLTAGES EXIST THAT ARE DANGEROUS TO LIFE. REMOVE ALL POWER PRIOR TO SERVICING.

CHAPTER 1
INTRODUCTION

1.1 FUNCTIONAL DESCRIPTION.

The Transceiver described in this instruction manual is a general purpose HF SSB (high frequency single sideband) equipment suitable for use in base station, mobile, or marine application. Basically, the Transceiver is a ten-channel equipment but it is available in a six-channel model as well. Any ten frequencies in the 1.6 to 30.0 MHz frequency range can be set up with no restrictions on frequency spacing. Modes of operation are compatible am (ame) and single sideband suppressed carrier. Optional accessories permit operation in selectable sideband mode, frequency shift keying (fsk), cw, voice privacy, two frequency simplex (called duplex for convenience), and reduced carrier (16 db down). Power output is 150 Watts p.e.p. and 100 Watts average. The entire Transceiver is self-contained and is modular in its construction. Power supplies are available for either 115/230 Volts 50/60 Hz or 12 or 24 Vdc.

1.2 ACCESSORIES OR OPTIONAL ITEMS.

AR-276	Card Extender, 22-pin, (one pair).
AR-277	Card Extender, 15-pin, (one pair).
SR-610M	Ten channel tapped coil automatic antenna coupler.
AR-250	AC Power Supply; 115/230 Volts, 47-63 Hz, or AR-250S 115 V sine/square wave.
AR-260	DC Power Supply; 12 or 24 Volts dc.
SR-280SA	DC to AC Inverter; 12 or 24 Volts dc.
AR-230	Selectable Sideband.
AR-231	Vox Module.
AR-232	Cw Module.
AR-233	Squelch Module.
AR-234	Noise Limiter Module.
AR-235	Voice Privacy Module.
AR-236	Tty Keyer and Converter Module (fsk).
AR-237	Blower Kit.
AR-238	Telegraph Key.
AR-239	Clarifier.
AR-240	Desk Type Dynamic Microphone.
AR-241	Telephone Desk Set with Cradle.
AR-242	Desk Type Ceramic Microphone.
AR-243	Headphones.
AR-244	Headphone with boom mike.
AR-246	Rack Mounting Kit for 19" rack with chassis slides.
AR-251	Mobile Shock Mounts (4).
SR-1600	Remote Audio Control - for remote audio control only. Does not include remote channel or mode selection.
SR-1601	Remote Control Unit (ac) - full remote control of all functions.
SR-1602	Remote Control Unit (dc) - full remote control of all functions.
SR-1650	Digital Remote Control system (long distance remote).

Channel Module Kits for Additional Channels:

SR-206/SR-210 (Non-Marine)

AR-221-A	1.6 to 2.5 MHz
AR-221-B	2.5 to 3.5 MHz
AR-221-C	3.5 to 5.5 MHz
AR-221-D	5.5 to 8.0 MHz
AR-221-E	8.0 to 12.0 MHz
AR-221-F	12.0 to 18.0 MHz
AR-221-G	18.0 to 24.0 MHz
AR-221-H	24.0 to 30.0 MHz

SR-206M/SR-210M (Marine)

AR-222-A	1.6 to 2.0 MHz
AR-222-B	2.0 to 2.25 MHz
AR-222-C	2.25 to 2.5 MHz
AR-222-D	2.5 to 3.0 MHz
AR-222-E	3.0 to 3.5 MHz
AR-222-F	3.5 to 4.0 MHz
AR-222-G	4.0 to 5.0 MHz
AR-222-H	5.0 to 6.0 MHz
AR-222-J	6.0 to 7.0 MHz
AR-222-K	7.0 to 8.0 MHz
AR-222-L	8.0 to 10.0 MHz
AR-222-M	10.0 to 12.0 MHz
AR-222-N	12.0 to 14.0 MHz
AR-222-P	14.0 to 16.0 MHz
AR-222-Q	16.0 to 18.0 MHz
AR-222-R	18.0 to 20.0 MHz
AR-222-S	20.0 to 22.0 MHz
AR-222-T	22.0 to 24.0 MHz
AR-222-U	24.0 to 26.0 MHz
AR-222-V	26.0 to 28.0 MHz
AR-222-W	28.0 to 30.0 MHz

Antennas:

AR-247	Doublet
AR-248	75 foot Long Wire
AR-249	150 foot Long Wire
AR-267	9 foot Whip Antenna
AR-268A	16 foot Fiberglass Whip (flange base)
AR-268B	16 foot Fiblerglass Whip (feedthru base)
AR-269A	35 foot Fiberglass Whip (feedthru base)
AR-269B	35 foot Fiberglass Whip (flange base)

Cables:

W-001	RG-8A/U Coaxial cable.
W-002	RG-58/U Coaxial cable.
W-004	Multi-conductor cable for connecting Transceiver to Antenna Coupler or Linear Amplifier.
W-006	Multi-conductor cable for connecting Transceiver to Remote Control.
W-007	AC line cord.
W-008	DC power cable.

Plugs:

P00300	Connector, PL-259 UHF Type for RG-8A/U cable.
P00301	Reducing adapter for using P00300 with RG-58/U
P00302	PL-258 Double-Male Adapter for PL-259
P00400	Connector, UG-536, N Type

1.3 SPECIFICATIONS - SR-206/210 SSB TRANSCEIVER.

GENERAL:

Frequency Range	1.6000 to 30.0000 MHz
Number of Channels	SR-206 - Six Simplex SR-210 - Ten Simplex Suffix (MS) describes marine simplex and (MD) marine duplex (two frequency simplex)
Channel Frequency Limitations	None within 1.6 to 30 MHz. Any mix of simplex and half duplex is possible - any frequency in any channel is possible. (M) FCC Type Accepted 2 to 23 MHz.
Modes of Operation	usb suppressed carrier lsb suppressed carrier (optional) ame (compatible am) cw fsk usb reduced carrier voice privacy (option)
Input Power	115/230 Volt (switch selected) 47-63 Hz, 350 W max. -or- 12 or 24 Volt dc (with dc power supply) -or- 115V sine or square wave (switch selected)
Temperature Range	-30°C to +50°C

TRANSMITTER:

Power Output	ame - 37 Watt carrier (average) ssb - 150 Watts p.e.p. cw - 100 Watts (average) fsk - 100 Watts (average)
Output Impedance	50 Ohms nominal
Frequency Stability	±1 pp 10^6
Duty Cycle	Continuous operation (key down at 100 Watts average power output)
Harmonic Suppression	40 dB (greater than 62 dB with optional harmonic traps)
Undesired Sideband	-50 dB
Carrier Suppression	50 dB
Intermodulation Distortion	-30 dB (relative to p.e.p.)

RECEIVER:

Circuit	Double conversion superheterodyne
Input Impedance	50 Ohms nominal
Frequency Stability	±1 pp 10^6
Selectivity	
Wide Band ssb	3 kHz - 6 dB, shape factor 2.7:1
Narrow Band ssb	2.1 kHz - 3 dB, shape factor 2.5:1
am (std)	12 kHz - 3 dB
am (opt filter)	8 kHz - 6 dB, shape factor 2.5:1
Size	8H x 16-1/2W x 17-5/8D (inches) 20H x 42W x 45D (cm)
Weight	50 lbs (23 kg)
Sensitivity	
am	1.5 microvolts for 10 dB s + n/n at 30% modulation with optional am filter
ssb	0.5 microvolt for 10 dB s + n/n
AGC	Threshold 2.5 microvolts; fast attack, slow release; flat within 6 dB from 10 to 500,000 microvolts

Audio Response	300 to 3000 Hz ± 1 dB
Audio Output	4 Watts
Audio Distortion	5% at 2 Watts output

1.4 LIST OF ASSEMBLIES AND SUBASSEMBLIES.

REF DESIG	TITLE
A1A1	Audio Distribution PC Board
A1A2	Audio Output PC Board
A2	Matching Network Assy
A2A1	Input Capacitor Assy
A2A2	Coil Assy
A2A3-A2A12	Matching Network Modules
A3	RF Amplifier Module
A3A1	RF Amplifier & Mixer PC Board
A3A2	Power Control PC Board
A3A3 thru A3A12	Channel Tuning PC Boards
A3A13	Duplex Switching PC Boards (Marine Duplex only)
A4	IF/Audio PC Board
A5	Power Supply Module (ac or dc)
A5A1	Regulator PC Board
A5A2	Filter PC Board (ac) Starting Circuit PC Board (dc)
A6	Frequency Generator PC Board (2 types)
A6A1 thru A6A10	Channel Oscillator PC Boards
A6A11	Clarifier PC Board (option)
A7	Basic Option PC Motherboard
A7A1	CW PC Board (option)
A7A2	Vox PC Board (option)
A7A3	Special Option
A7A4	Squelch PC Board (option)
A8	Duplex Frequency Generator PC Board (Marine Duplex only)
A9	FSK Keyer/Converter PC Board (option)
A10	(Not Used)
A11	Voice Privacy PC Board (option)
(No Prefix)	Standard or Marine Motherboard (p/o Main Frame Assembly)

1.5 EQUIPMENT SUPPLIED.

The following items are supplied with each Transceiver. Optional items are supplied as ordered and are listed on the packing list for each shipment.

QTY	PART NO.	DESCRIPTION
1	SR-206/210(M)	Transceiver
1	MP0502	Alignment Tool
1	MP0504	Contact Removal Tool
1 set	FXXXXX	Spare Fuses
1	DS1001	Spare Lamp
1	TM-0210( )	Technical Manual

Also furnished are all mating plugs and/or options as required, including a standard microphone or optional handset or deskset.

1.6 EQUIPMENT REQUIRED BUT NOT SUPPLIED.

1.6.1 Antenna Coupler. - Unless the Transceiver is used with a broadband antenna or with a fan doublet, if multichannel operation is required, an antenna coupler is required. The SR-610M Antenna Coupler is recommended.

1.6.2 Cable. - When the Transceiver is used with an antenna coupler, two cables are required for interconnection with that unit. One will be the coaxial cable (either RG-8A/U or RG-58/U) for the rf connection, and the other is the multiconductor control cable. Terminals and plugs for the cable are supplied with the Transceiver and the Antenna Coupler.

1.6.3 Antenna. - An antenna is required for use with this Transceiver. Any broadband antenna with a vswr (voltage standing wave ratio) of 2:1 or better, with a nominal impedance of 50 Ohms, is suitable. If only a single frequency is used, a doublet antenna can be used if it is adjusted to the proper length for your channel frequency. For multi-channel use with an antenna coupler, any of the following antennas may be used. The longwire antennas are furnished with halyards and insulators. The whip antennas are furnished with mounting bases and mounting hardware:

AR-248 - 75 foot long wire
AR-249 - 150 foot long wire
AR-267 - 9 foot stainless steel whip
AR-268 - 16 foot fiberglass whip
AR-269 - 35 foot fiberglass whip

CHAPTER 2
INSTALLATION

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2.3	Mounting
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2.5	Accessory Connections
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2.7	DC Power Supply Connections
2.8	Antennas
2.9	Grounding
2.10	Mobile or Marine Noise Suppression
2.11	Initial Operation and Checkout

Figures and Tables	Function
Fig 2-1	Mounting Dimensions
Table 2-1 and Fig 2-2	Connectors
Fig 2-3	Horizontal Doublet Antenna
Fig 2-4	Inverted "V" Antenna
Fig 2-5	Ant. Construction and Radiation Pattern

2.1 GENERAL.

Installation consists of mounting the Transceiver, providing an antenna for the set, and making the various power, microphone, and antenna connections. If used with an SR-610M Antenna Coupler, the instruction manual for that unit should be consulted for all aspects of antenna installation. Otherwise, information in this chapter will tell you how to construct a doublet antenna for use without a coupler. If used with an SR-110 Linear Power Amplifier, the instruction manual for that unit will describe the system aspects of installation. If used with a Remote Control Unit, the instruction manual for that unit will describe installation considerations with respect to interface with the Transceiver.

It is assumed, at this point, that your Transceiver was ordered from the factory with the necessary channels installed and adjusted to frequency. If this is not the case, refer to "Rechanneling" information in Chapter 4 before proceeding.

It should be understood, before you begin installation, that the effectiveness and reliability of the completed station depends on how well the Transceiver is installed. Several suggestions are made in this chapter on grounding, antennas, noise reduction and so on. Careful attention to such details is well worth the effort.

2.2 UNPACKING AND INSPECTION.

Remove all packing material and carefully lift the unit from the box. The Transceiver and each item should be carefully inspected for physical damage. If any damage is noted, save all packing material and immediately notify the transporter. Before any packing material is discarded, all items supplied should be checked against the packing list accompanying the shipment.

2.3 MOUNTING.

The Transceiver is shipped with mounting feet suitable for convenient setup on any flat surface, such as a desk or bench. Rack mounting kits are available for Transceiver installation in a 19 inch rack. Figure 2-1 shows dimensions of Transceiver and provides mounting information for mobile installations.

2.4 MICROPHONE, HEADPHONE, CW KEY CONNECTIONS.

Front panel MICROPHONE connector J1 provides connections for a carbon or transistorized dynamic microphone, a headset, a telephone handset or deskset, or a cw hand key. (Cw hand key connections may be made either at J1 pins 1 and 6 or at J7 pins 7 and 9 (rear panel. Earphones may be connected to the external speaker output at J7.)

Table 2-1 describes the connectors on the Transceiver, and figure 2-2 illustrates the locations of the rear panel connectors. The schematic diagram of the main frame in Chapter 6 provides connector pin data.

Note that speaker muting in conjunction with a telephone deskset requires removal of a jumper between E43 and E44 on Audio Distribution PC Board A1A1. (See main frame schematic diagram.)

2.5 ACCESSORY CONNECTIONS.

Connection information for accessories such as TTY, Remote Control, or Antenna Coupler is provided with the instruction manuals or addenda for the accessories. Usually, cables or mating connectors are supplied to facilitate installation. Accessories are usually connected at J5. Connections for purposes other than normal options and accessories can be determined from connector data in the main frame schematic diagram (Chapter 6).

2.6 AC POWER SUPPLY CONNECTIONS.

Connections for ac power (when ac power supply is included in the set) are made directly to a Power Supply Module connector through a cutout in the rear panel. A line cord for this purpose is supplied. When the Transceiver is ordered as a part of a complete Transceiver or Transmitter System, the power cord is already installed in the rack cabinet and is wired through a safety interlock switch.

The standard ac power supply configuration provides a switch (located behind a hole plug, figure 2-2) for selection of 115 or 230 Vac operation. Be sure to check the position of this switch before plugging the line cord into the power source, and check the value of the fuse (figure 2-2).

An alternate ac power supply may be ordered, which allows 115 Vac operation only, but with selection of "SINE" or "SQUARE" wave operation by the switch normally used for 115/230 Vac selection. The SINE position allows operation from the normal 115 Vac main; the SQUARE position allows operation from an optional SR-280SA DC-to-AC Inverter. Such arrangement provides fast changeover to dc operation, when required, simply by resetting the rear panel

switch and obtaining square-wave ac power from the external Inverters. Refer to separate manual if SR-280SA has been supplied with your Transceiver.

The power supply has taps on the primary of the power transformer to provide compensation for high or low line voltage. A procedure is included in Chapter 11 for changing taps. If your ac line measures more than 2 or 3% high or low with a multimeter, a tap change may be necessary.

2.7 DC POWER SUPPLY CONNECTIONS.

The DC Power Supply Module may be supplied in place of the ac version. This allows operation on 13.2 or 26.4 Vdc (12-14 Vdc or 24-28 Vdc). Input power required for full transmitter output is 25 Amp at 13.2 Vdc or 15 Amp at 26.4 Vdc. Voltages cannot be switched readily from one range to another; the set must be ordered either for 13.2 Vdc or for 26.4 Vdc.

Primary power is connected to the special high current connector (on the DC Power Supply Module) which protrudes through the rear of the set. A mating connector is usually supplied. A cable should be fabricated, and both leads should be connected directly to the vehicle's battery to get full voltage and to reduce noise. The red lead is positive and the brown lead is negative.

To fabricate a cable, heavy gauge power cable should be used and the cable length should be as short as possible to minimize voltage drop. Voltage drop in the cable should be less than $\frac{1}{2}$ Volt on 13.2 Vdc installations or less than 1 Vdc on 26.4 Vdc installations under full load. Connector pins are identified in figure 2-2 for reference.

All fuses are located inside the Transceiver on the DC Power Supply Module.

2.8 ANTENNAS.

2.8.1 General.

The antenna used with this Transceiver will be an important factor in the performance of the system. The Transceiver is designed to provide optimum performance when connected to a resonant antenna or resonant antenna system with an impedance of 50 Ohms and a vswr which does not exceed 2:1.

For single channel operation, a doublet or an inverted "V" type of antenna can be used. When either of these types of antennas are used they should be arranged so they are located broadside to the general direction of the receiving station. The same applies to a long wire arranged horizontally. The reason for this is that the radiation from the end of a doublet or inverted "V" is minimum and it is maximum at right angles. For a long-wire antenna which is less than a wavelength long, the maximum radiation is at right angles to the direction of the wire.

Horizontal antennas are generally better suited for long-distance or sky-wave propagation than are vertical or whip antennas. Whip antennas are omni-directional and are suited to ground wave operation or to very long distance operation where minimum radiation angle may enhance performance.

In any case, long distance operation will depend upon the conditions of radio wave propagation which in turn depends upon the time of day, the season and the sunspot activity cycle (eleven years). In general, better performance is obtained with higher frequencies during daylight hours and lower frequencies at night. Similarly, higher frequencies are more effective during winter than summer. For longer distances, higher frequencies are more effective than lower frequencies. Typical maximum usable

frequencies (MUF) are shown below for a location of 39 degrees north latitude and a 300 mile path.

	Sunspot Min 1954 & 1964	Sunspot Max. 1958 & 1968
Daylight - Summer	6 MHz	9 MHz
Night - Summer	3 MHz	6 MHz
Daylight - Winter	8 MHz	14 MHz
Night - Winter	4 MHz	6 MHz

Further information on predicting maximum usable frequencies and propagation conditions is available from the U. S. Government Printing Office under the title: "Handbook for CRPL Ionospheric Predictions, based on Numerical Methods of Mapping Handbook 90."

2.8.2 Antenna Coupler Operation.

When the antenna system includes an antenna coupler, such as the SR-610M, a single whip or longwire antenna can be used on all channels, since the coupler tunes the antenna to resonance for each channel independently. Such an installation is ideal for stations with limited antenna space and for mobile and marine applications. An rf cable is connected from J2 on the Transceiver to the input of the coupler, and a control/power cable is connected from J6 on the Transceiver to the coupler. Refer to the antenna coupler instruction manual for installation details.

2.8.3 Doublet Antenna.

A doublet antenna is a tuned antenna cut to length to provide a 50 Ohm match at one frequency. It is more efficient than a whip or longwire antenna tuned with an antenna coupler; however, a separate antenna must be installed for each frequency (or each group of frequencies which are extremely close together).

The AR-247 Doublet Antenna Kit is available as an accessory. Two types of doublet antennas can be constructed, using this kit. The simplest is a horizontal "dipole" or "doublet" strung between two poles. Construction details are given in figure 2-3. The other type of antenna is called an inverted "V", for obvious reasons (see figure 2-4). This type of antenna requires only one tall pole for support. Either type of antenna radiates (transmits) and receives best in the directions perpendicular to the antenna, as illustrated in figure 2-5.

The AR-247 Doublet Antenna Kit is supplied with 200 feet (65 meters) of antenna wire, 50 feet (15 meters) of RG-8/U coaxial cable, a center insulator, polypropolene rope, end insulators, and coaxial connector. (The coaxial cable, center insulator, and antenna wire are assembled at the factory.)

To install the antenna, it is merely necessary to compute the overall length from the formula given, cut the antenna wire to length, attach the end insulators to the wire, and raise the antenna with the rope supplied. (Refer to figure 2-3 or 2-4.) When cutting the antenna wire, leave an additional 6 inches (15 cm) at each end to allow for attaching the insulators.

As an example, say your operating frequency is 4000 kHz. By the formula, the length of a horizontal doublet antenna should be 117 feet overall, or 58.5 feet on each side of the center insulator. Therefore, adding the 6 inches to each side for attaching the insulators, cut the antenna wire on each side to a length of 59 feet.

The doublet antenna should be erected in an open area away from tall trees, buildings, etc., and be approximately 30 feet above the ground. If possible, the coaxial cable should be brought away from the antenna at a 90° angle and not run back to the antenna.

After the antenna is installed, it is necessary to test the antenna to be certain that it is resonant at the operating frequency. The testing should be done with a Vswr bridge or through-line wattmeter of known accuracy. For best operation, the standing wave ration should be 1:1; however, any standing wave ratio of 1.5:1 or less is acceptable. Should the Vswr not be acceptable, it is then necessary to experiment slightly with the length of the antenna by shortening or lengthening each side of the antenna by equal small amounts at a time until the proper resonant point is found. The formula allows for the cutting of the antenna close to the resonant point but due to variables such as height above the ground, nearby objects, etc., some small changes are usually necessary at the time of installation.

WARNING

Do not adjust the antenna when transmitter power is on!

2.9 GROUNDING.

A connection should be made from one of the tapped holes in the rear of the Transceiver to a good rf ground. This ground will aid in minimizing any rf energy around the set and its audio and control cables. The tapped holes in the rear panel can also be used with cable clamps and hardware supplied to dress the cables neatly at the rear of the unit and to take the strain off the connectors.

2.10 MOBILE OR MARINE NOISE SUPPRESSION.

2.10.1 General.

The ability of a vehicular or marine mobile radio operator to copy weak signals can be seriously hampered by noise generated by the vehicle. A noise limiter installed in the transceiver can reduce operator fatigue from listening to the noise, but the noise will still mask weak signals. The only way to eliminate noise is to suppress it at its source. Following are some suggestions for eliminating noise.

Mobile noise can be classified in two major types: noise radiated and subsequently received as a radio signal at the antenna and noise carried along power wiring to the circuitry in the set. The first is more common. In order to determine which type of noise is causing the problem, try disconnecting the antenna. If the noise disappears, it is radiated noise being received at the antenna. Refer to paragraphs 2.10.2 and 2.10.3 for suggestions.

If radiated noise is present even with the engine shut off, the noise is coming from sources other than the vehicle and cannot be cured directly.

If the noise is present with the antenna disconnected, the noise is ripple or transients on the power wiring. Refer to paragraph 2.10.4.

2.10.2 Ignition Noise.

Ignition noise sounds like a popping in the speaker with a frequency that varies with engine speed. This noise can usually be masked by strong signals, but it will interfere with weaker signals. This type of noise can be generated by spark plugs, distributors, spark coils, and arcs in the high voltage wiring. It will disappear when the engine is turned off. A portable transistor broadcast radio can be used to detect such problems. The interference to the radio will be greatest when the radio is held close to a noise source. Following are suggestions for eliminating this type of noise. Several of these steps may have to be taken to completely eliminate the noise.

a. If the vehicle does not have resistance wiring to the spark plugs, resistor plugs should be used.

b. If the vehicle does not have a resistance lead from the coil to the center of the distributor, break the lead at the distributor, and install a plug-in resistor of the type made for this purpose.

c. If resistance wiring is used, it is possible to have breaks in the conductor path which cause arcing. If arcing does occur, the lead should be replaced.

d. Check to see that distributor points and condenser are in good condition. Check the distributor rotor.

e. Check the timing and adjustment of distributor points.

f. Clean dirt and grease from spark plug insulators, and check that spark plugs are not worn or out of adjustment.

g. Install a 0.5 uF coaxial bypass capacitor to bypass the battery lead of the spark coil to ground.

h. Make sure that the ignition coil case has a clean connection to the engine block.

2.10.3 Charging System Noise.

Generator or alternator noise appears as a high pitched whine which varies in frequency with engine speed. Voltage regulator noise usually appears as a raspy sound or irregular popping. The suggestions which follow can be used to eliminate these problems.

a. Bypass the armature terminal on the generator to ground with a feed through type 0.5 μF capacitor having a current rating high enough for your charging system. The capacitor should be mounted on the generator case. Connect the normal armature lead at one terminal and connect the armature to the other terminal. Keep the lead from the armature to the capacitor short.

CAUTION

Do not by-pass the field terminal, as damage to the voltage regulator contacts can result.

b. Special coaxial bypass capacitors are available for alternator systems. Follow the manufacturer's recommendations.

c. Voltage regulator noise can be eliminated by installing a .002 μF capacitor and a 5 Ohm resistor in series to ground from the field terminal on the voltage regulator. Keep leads short. The battery and armature leads from the voltage regulator can be bypassed to ground with 0.1 to 0.5 μF disc capacitors.

2.10.4 Power Wiring Noise.

Any device in the vehicle which is alternately making and breaking an electrical circuit can cause popping sound to appear on the power wiring. Similarly, the generator causes some ripple to be produced on the primary wiring to the battery. This noise can appear on the power wiring to the set and have the same effect as power supply ripple has in ac operated radios. This noise will not disappear when the antenna is disconnected. It may even be present on the transmitted signal.

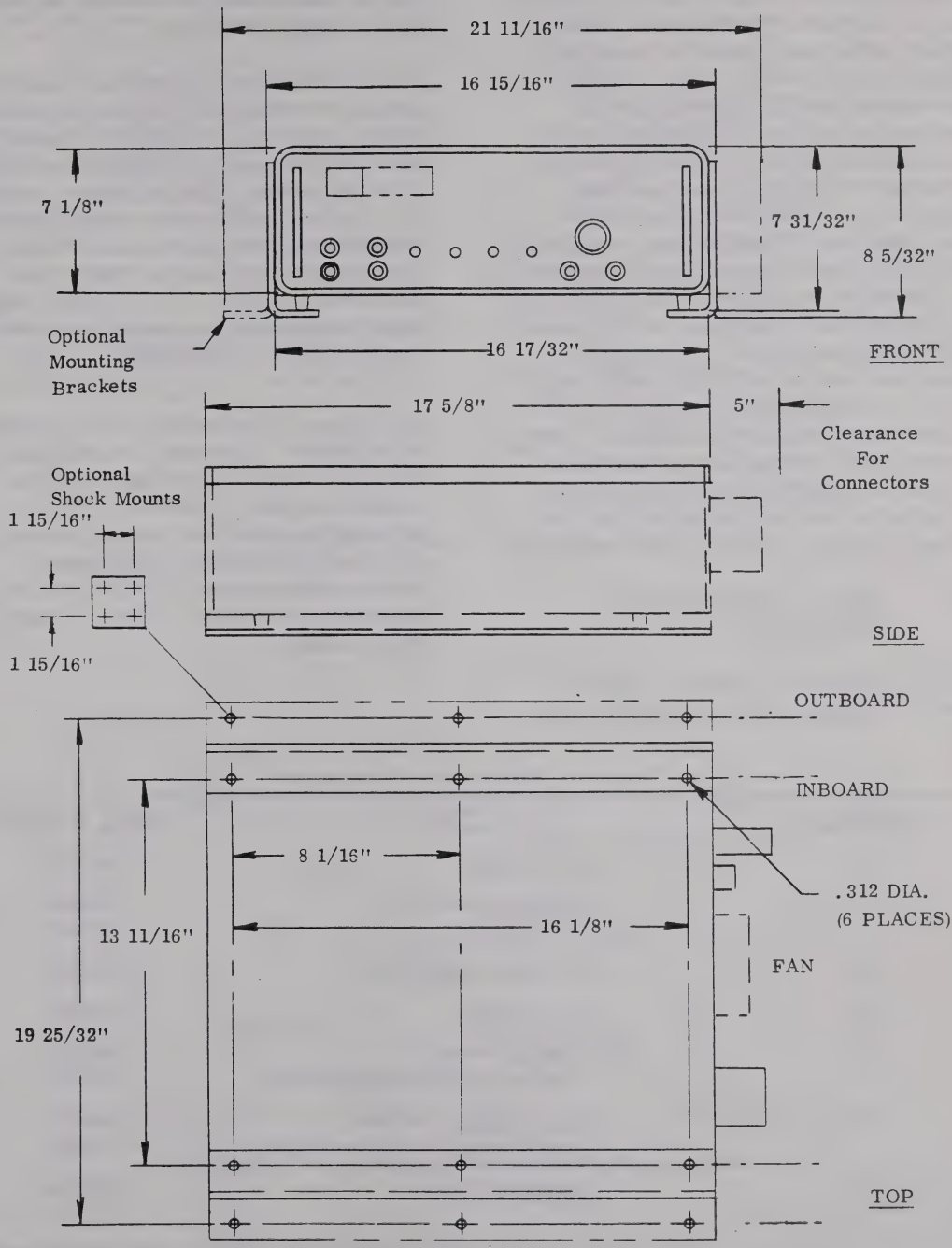


Figure 2-1. Mounting Dimensions

Some precautions should be taken when installing the set to minimize the possibilities of this type of interference. Both battery cable leads should be connected directly at the battery posts. Connecting the negative lead to the chassis or the positive lead to parts of the wiring in the vehicle places noise carrying conductors in series with the leads to transistor stages in the set and should be avoided. The power cable should be kept away from high voltage wiring to minimize inductive or capacitive coupling of noise to the power lines to the set. The power wiring should be of heavy gauge wire to provide a low impedance path to the battery which acts as an excellent filter. The power cable should be kept as short as possible. The battery should be kept in good condition to provide good filtering. An old battery has a higher internal resistance and consequently poorer filtering action occurs.

2.11 INITIAL OPERATION AND CHECKOUT.

Prior to operation, Chapter 3 should be read thoroughly to become familiar with the functions of the controls and indicators. The set should then be activated and tested in each channel and mode.

It is not necessary to adjust anything inside the Transceiver for a normal installation. However, if an antenna coupler is used, coupler tuning is required according to the procedure in its instruction manual. If an antenna coupler is not used, the vswr of individual resonant antennas should be checked to ensure that the vswr is less than 1.5 to 1. If an SR-110 Linear Power Amplifier is used, its manual contains a system checkout procedure.

Each channel is adjusted to be on frequency at the factory. However, crystals age off frequency slightly, especially when the crystals are new. Therefore, it is advisable to check the channel frequencies occasionally during the first several months to determine if a correction adjustment is necessary. Refer to Chapter 5 for procedure.

Table 2-1 Transceiver Connectors

DESIGNATOR	FUNCTION	PART NUMBER
J1	Microphone	J00201
J2	Antenna, type UHF	J00300
	or type N	P00401
J3	Rx Test, or KW PPC	J00100
J4	Fan, 4 pin	J00200
J5	Remote, 36 pin	J00253
	or 36 pin (MS-3102A-28-15S)	J00255
J6	Ant. Coupler, 36 pin	P00253
	or 17 pin (MS-3102A-20-29S)	J00254
J7	Options, 12 pin	X00700

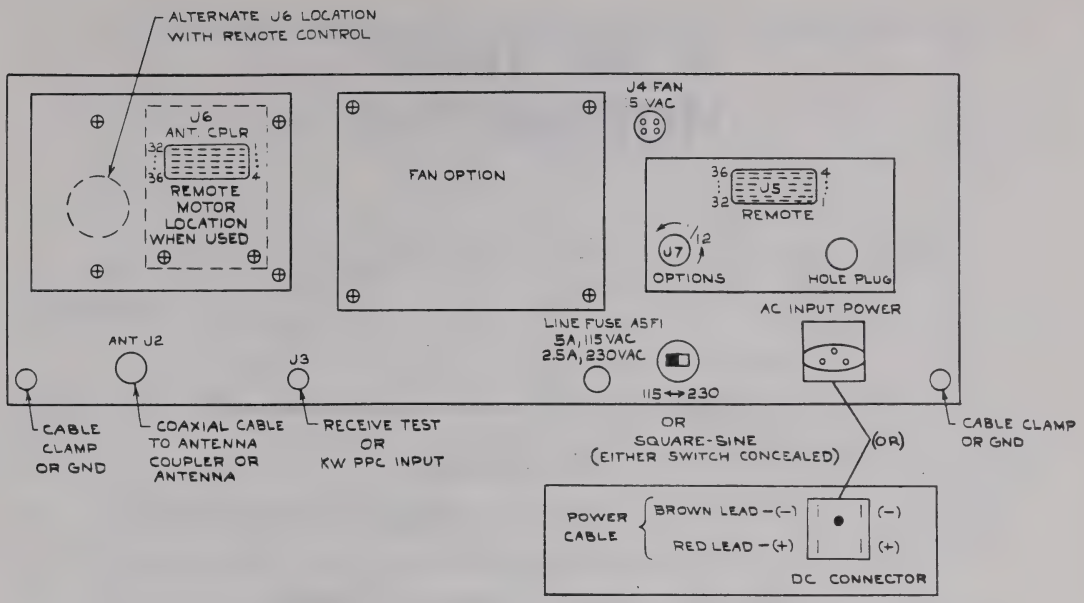


Figure 2-2. Rear Panel Connectors

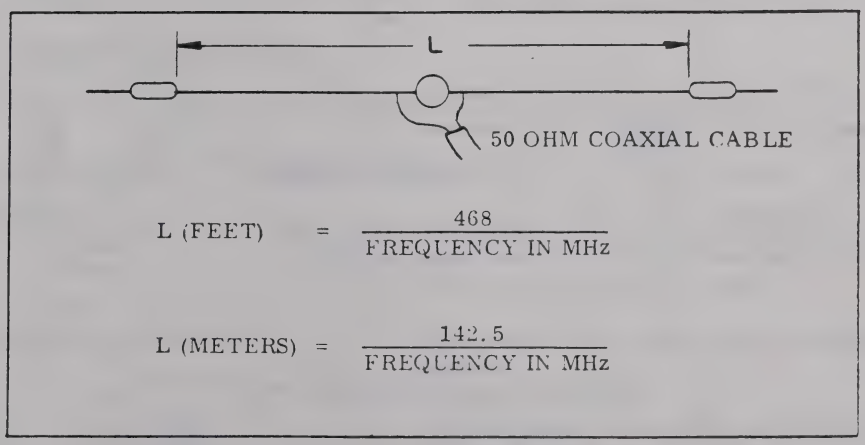


Figure 2-3. Design of Horizontal Doublet Antenna

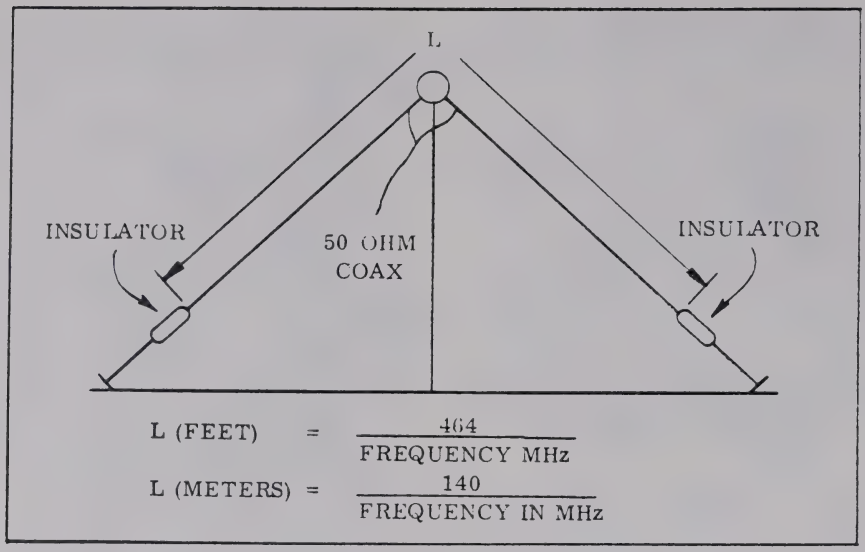


Figure 2-4. Design of Inverted "V" Antenna

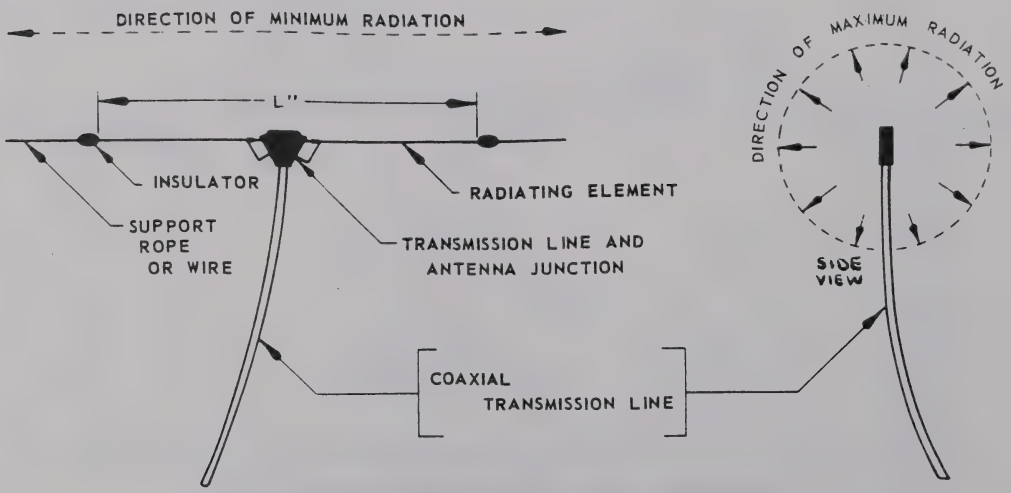


Figure 2-5. Construction Details and Direction of Radiation of Doublet Antennas

CHAPTER 3
OPERATION

TABLE OF CONTENTS

Paragraph	Title
3.1	Operating Precautions
3.2	Operating Controls
3.3	Operating Procedures
3.4	Periodic Operator Maintenance

3.1 OPERATING PRECAUTIONS.

WARNING

Even with only top and bottom covers removed, dangerous voltages exist. In certain stages of disassembly, high voltages exist that are DANGEROUS to life. Remove all power prior to servicing.

The Transceiver contains protective devices which prevent damage in the case of an operational fault. However, to ensure reliable, trouble-free operation, operate the Transceiver with a properly tuned antenna and ensure that input voltages are within their ratings.

3.2 OPERATING CONTROLS.

All controls required for normal operation are located on the front panel.

3.2.1 Basic Controls. - *Options depending on function required.

CHANNEL selector switch	Selects the assigned frequency of operation and pre-tuned output networks. In marine sets, it also selects the proper mode.
Function selector switch	Selects one of four operational conditions:
OFF	All power removed
STANDBY	Crystal ovens, filaments, and +800V on.
RECEIVE	Receive mode only
TRANSCEIVE	Transmit mode upon keyline closure, otherwise receive

*Mode selector switch	Selects one of five operational modes:
LSB	Lower sideband suppressed carrier (optional)
USB	Upper sideband suppressed carrier
AM	Amplitude modulation equivalent (upper sideband and carrier)
CW	Continuous wave, tone offset from carrier by 1 kHz
FSK	Frequency shift keying or receive conversion.
TRANSMIT AUDIO	Adjusts the transmitter for rated output. Clockwise rotation increases output.
RECEIVE AUDIO	Adjusts speaker or headset volume for comfortable listening. Clockwise rotation increases volume.
*PHONE PATCH switch	Provides for four to two wire conversion in RECEIVE and TRANSMIT positions to allow connection to telephone line. In TRANSMIT, the transmitter is also keyed. In OFF, normal transceiver operation is enabled.
*SPEAKER switch	Selects connections of audio amplifier to speakers:
INT	Internal speaker
OFF	Speaker disabled
EXT	External speaker (if used)
*LOCAL/REMOTE switch	Provides front panel switching of audio and keying functions to a remote location for remote control operation.

3.2.2 Internal Controls.

Cathode current/relative power	Located on the underside of the RF Amplifier Module in the pa section. It selects the function which the front panel meter monitors in transmit. Normal function monitored is relative power output.
Keyline	On the A1A1 Audio Distribution PC Board behind the front panel is a pin (P)12; which when grounded, keys the transmitter.
Am tune	On the A1A1 Audio Distribution PC Board, a ground on pin (P)11 not only keys the transmitter, but also provides carrier output.

3.2.3 Front Panel Option Controls.

CLARIFIER	Provides vernier/off adjustment of the receive frequency. Cw rotation decreases frequency.
RF GAIN	Provides manual rf gain to the receiver front end. Cw rotation decreases sensitivity.
VOX	Provides for vernier control of the voice-operated transmit function. Cw increases sensitivity; ccw is push-to-talk.
LIMITER	Provides vernier/off adjustment of the noise limiter level. Cw is maximum sensitivity.
SQUELCH	Provides for vernier control of receive voice sensing. Cw decreases sensitivity. Ccw is OFF.

3.3 OPERATING PROCEDURES.

3.3.1 Oven Warm-up. - To ensure operation within the specified frequency tolerance, allow a 20 minute warm-up prior to operation. The standby mode minimizes power drain while energizing oven power. FCC TYPE ACCEPTED EQUIPMENT REQUIRES 20 MIN.

3.3.2 Receive RF Gain Control (Option). - When operating on a channel with strong adjacent channel interference producing noticeable distortion, reduce the receiver sensitivity with this manual control.

3.3.3 Transmit Audio Control. - With the control set at its normal position (facing TRANSMIT indicator), normal inputs will provide full power output. A control increase with normal signal will not increase power due to power feedback control; however background noise may increase. Meter reading is less than "100".

3.3.4 Input Power. - Transceivers may be supplied with either 115/230 Vac, 115 Vac sine or square wave, 12 Vdc or 24 Vdc. To prevent damage, ensure that the power source to which the equipment is connected is correct.

3.4 PERIODIC OPERATOR MAINTENANCE.

Design of the Transceiver requires no periodic operator maintenance other than filter cleaning when the blower option is used. The filter may be removed by removal of the blower mounting screws. It may be washed in warm soapy water. Ensure that the filter is dry prior to re-installation on the radio.

CHAPTER 4
RECHANNELING

TABLE OF CONTENTS

Paragraph	Title
4.1	General
4.2	Channel Crystals
4.3	Channel Oscillator Selection
4.4	Channel Tune Strip Selection
4.5	PA Matching Network Setup
4.6	Setup Procedure
4.7	Tuning Procedure
Fig/Table	**Function**
Tables 4-1 & 4-2	Crystal Data
Figure 4-1	Crystal Locations
Table 4-3	Channel Strip Jumper Data
Tables 4-4 & 4-5	Components for Each Channel
Figure 4-2	Simplified Matching Network Diagram

4.1 GENERAL.

This chapter provides data and explanatory material concerning components which change with channel frequency, and it provides established procedures which can be used if it is necessary to change frequencies in the field.

A small change in frequency can usually be made by installing a new crystal and retuning. A larger change or adding an additional channel involves changing or adding other components and networks in addition to installing a new crystal. Material in this chapter describes the components used and the procedures necessary to rechannel the set. However, if a problem develops or for frequencies over 23 MHz, you may want to consult the factory for additional assistance.

4.2 CHANNEL CRYSTALS.

The Transceiver uses a separate channel crystal for each transmit frequency. The crystals are located on Frequency Generator Board A6. Crystal locations are identified in figure 4-1.

The channel crystal frequency is determined by adding the first if frequency to the channel carrier frequency. For example, a set to be tuned to a carrier frequency of 3.500.000 MHz would require a channel oscillator crystal of 5.000,000 MHz for a 1500 kHz if or 4.900,000 MHz for a 1400 kHz if. For combinations of channels which result in a transmit or receive spurious, alternate first if frequencies 20 kHz high or low are available. (See table 4-2). Use of these alternate frequencies requires an appropriate correction of channel oscillator crystal frequency by ±20 kHz.

Table 4-1 lists the important characteristics of the channel oscillator, 2nd local oscillator, and carrier oscillator crystals. However, due to the requirement for high quality crystals to provide best results, it is strongly recommended that crystals be ordered from the Transceiver Manufacturer.

4.3 CHANNEL OSCILLATOR SELECTION.

Individual channel oscillator modules are plugged into Frequency Generator PC Board Assembly A6 for various channels. The correct module for each channel is selected from four available modules, which cover the hf frequency range in bands as follows. (Further information may be found in Chapter 13.)

1.6-3.5 MHz - Low-A Type Module
Chan. Freq.

3.5-12.0 MHz - Low-B Type Module
Chan. Freq.

12.0-18.0 MHz - High-A Type Module
Chan. Freq.

18.0-30.0 MHz - High-B Type Module
Chan. Freq.

4.4 CHANNEL TUNE STRIP SELECTION.

The plug in cards located on RF Amplifier Assembly A3 contain the tuned circuits required for receive, and the tuned circuit which tunes the output of the 12BY7A on transmit. Each strip or card covers a band of frequencies which can be extended to a new band by adding three jumpers. Each of the jumpers adds a fixed capacitor to one of the tuned circuits. For example: band 1 will tune from 2.0 to 2.5 MHz without the jumpers. When the jumpers are added, it will tune from 1.6 to 2.0 MHz. Table 4-3 shows the band arrangement for the channel strips and the Channel Tune Strip component location diagram in chapter 9 shows the jumper locations.

4.5 PA MATCHING NETWORK SETUP.

Refer to simplified schematic diagram figure 4-2. The power amplifier matching network consists of an input capacitor (C6, C7) an inductor (L5, L6) and an output capacitor (C8, C9) arranged in a pi configuration. The magnitude of the inductance is varied in a coarse manner by choosing the tap on L6 and is adjusted to its exact value by means of C12, C13. Switch S1-A (not shown) selects the input capacitor, and S1-C and S1-D select the output module assembly. The output module assembly consists of C8, C9, C12, and C13; and it is mounted on a bracket along the side of the set.

The values and part numbers for the components used may be found in tables 4-4 and 4-5. The proper matching network coil tap may be found by referring to Table 4-5. The number of the tap is illustrated in figure 4-3, the coil assembly view. The range of the taps is referenced to the band segment edges, the exact tap for a specific frequency may be found by interpolation.

4.6 SETUP PROCEDURE.

Following is a step-by-step procedure for performing various assembly and component checks and changes prior to tuning the set with power applied.

a. Obtain and install a new crystal in the appropriate place on the A6 Frequency Generator PC Board Assembly. (Refer to chapter 13 for location.) After installing new crystal(s), close oven and install board in the set.

b. Determine from data in paragraph 4.3 if a channel oscillator board must be added or changed. Make change as required. (See Chapter 13 for locations.)

c. Determine from tables 4-3 and 4-4 if a channel tune strip must be changed or added and what jumpers must be installed. Make required changes. (See Chapter 9 for locations.)

d. Determine from tables 4-4 and 4-5 what matching network components are required. Make the required changes. Determine from table 4-5 what tap is required on pa coil L6. Make the required change. Be sure that the solder is removed from the previous tap position, and check new tap connection to be sure solder is not shorting two turns together.

WARNING

Be sure that the set is turned off, short 6146 tube caps to the chassis, and short L6 of the matching network to the chassis before any changes are made. Reinstall the pa shields after the changes have been made.

4.7 TUNING PROCEDURE.

After the major changes in paragraph 4.6 have been completed, the Transceiver is ready to be tuned as follows.

a. Set the function switch to RECEIVE.

b. Set the channel switch to the desired channel.

c. Connect a signal generator to J3, the receive test jack on the rear panel. (If the Transceiver is used with a Linear Power Amplifier, J3 is not connected to the receive input. Connect generator to normal antenna connector J2; but be careful not to key set with generator connected.)

d. Set the signal generator to the desired receive frequency. Adjust the level of the generator to obtain a small indication on the Transceiver panel meter.

e. Peak L2 and L3 on the appropriate channel tune strip for maximum indication, adjusting the generator level to keep the indication no higher than necessary.

NOTE

The higher frequency channel tune strips have the possibility of being tuned on the wrong frequency. This frequency is the channel crystal frequency PLUS the IF Frequency rather than the channel crystal frequency MINUS the IF Frequency. If a channel tune board or one of its coils has been replaced the slugs in L2, L3 and L4 should be pre-set to their lowest frequency position (slugs in the center of the coil body), then turned out until the tune point has been found. If the channel tune strip has been tuned to the wrong frequency, it will be noticed later when a receive sensitivity check indicates a channel with very poor sensitivity.

f. Remove the signal generator from J3. Remove A3A1P1 from J10, which is on the Signal Distribution Motherboard.

g. Connect signal generator to A3A1P1. Set its frequency to the first if frequency. Adjust generator for approximately 100% am modulation.

h. Connect a 100 Watt rf dummy load to antenna connector J2.

i. Set the function switch to TRANSCEIVE, and key the set. Set the signal generator to obtain some output indication on the Transceiver panel meter. (Slide switch S1 in the pa tube compartment must be in the relative power output position.)

j. Peak L4 on the appropriate channel tune strip for maximum indication. Unkey set.

k. Locate compression mica trimmer capacitor A2C12 on the appropriate output module near the side of the set. Key the set, and adjust the capacitor for maximum indication on the front panel meter. If a peak cannot be obtained, move the tap on A2L6 in the proper direction. If A2C12 tuned to maximum capacity (fully ccw), more inductance is required; move A2L6 tap for appropriate channel toward the rear. If the reverse is true, move the tap toward the front.

l. When tuning adjustments have been completed and rechecked, set the signal generator output level for -60 dBm output (225 μV), and remove modulation.

m. Adjust R2 on the appropriate channel tune strip for half scale indication on the front panel meter.

n. Check other channels with signal generator tuned to the channel frequencies and set up as in step (b). The output indication should be half scale on the front panel meter. If not, adjust R2 on appropriate channel tune strips. Unkey set.

o. Reconnect A3A1P1 to J10. Set mode switch to AM. Connect power meter or rf voltmeter to output of Transceiver if available.

p. Key the Transceiver. Adjust carrier control A3A2C9 on the Power Control Board for an output indication of 32 Watts, or 40 Vrms across 50 Ohms, or half scale on the front panel output meter.

q. Disconnect A3A1P2 from J9, which is located on the Signal Distribution Motherboard. Connect a frequency counter to J9.

r. After the set is turned on for at least 20 minutes (or preferably one hour), adjust the trimmer on the appropriate channel oscillator module on Frequency Generator PC Board A6 for the correct oscillator output frequency as stamped on the crystal can.

s. This completes the tuning procedure. After checking to ensure that all steps were completed properly for the channel(s) involved, disconnect test equipment and restore Transceiver to normal operation.

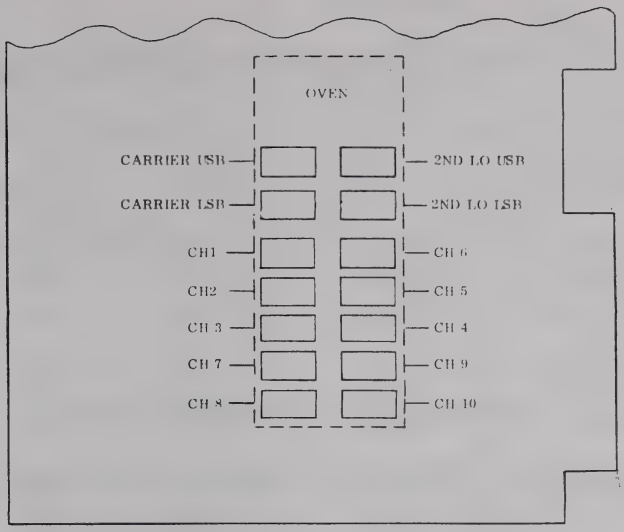
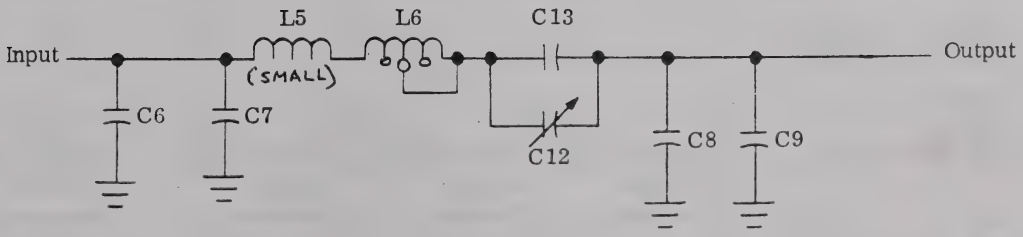


Figure 4-1. Frequency Generator PC Board 1A6, Crystal Location Diagram (View from Printed Wiring Side)



NOTE: Each component shown has values switched into the circuit for each channel. This diagram represents only one typical channel for clarity.

Figure 4-2. Matching Network, Simplified Schematic Diagram

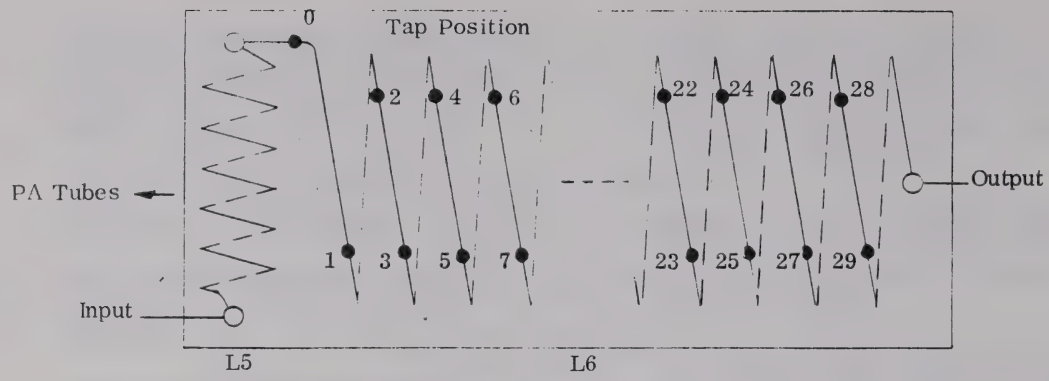


Figure 4-3. PA Coil Assembly, Top View

TABLE 4-1. OSCILLATOR CRYSTAL SPECIFICATIONS

	CHANNEL	2ND LO (Local Oscillator)		CARRIER
		Without clarifier capability	With clarifier option capability	
Part Number	Y20001	Y103XX	Y103XX	Y101XX
Holder Type	----------	All HC-6/U		
Oven Temperature	----------	All 75° C		
Frequency Tolerance	----------	All ±.0002%		
Frequency Stability over Oven Stability Range of ±1°C	----------	All ± 1 ppm		
Mode of Oscillation	Fundamental Parallel Resonant	Fundamental Series Resonant	Fundamental Series Resonant	Fundamental Parallel Resonant
Capacitance Load	32.0±0.5 pf	N/A	N/A	20pf
Shunt Capacitance	----------	All 7 pf		
Shock, Vibration, Aging-per Mil Spec	CR-68/U	CR-68/U	CR-68/U	CR-47A/U
Equivalent Series Resistance	per CR-68/U	150Ω max.	150Ω max.	7500Ω max.

TABLE 4-2. IF FREQUENCY AND CHANNEL CRYSTAL ALTERNATIVES

FILTER BANDWIDTH	IF FREQ kHz	CARRIER FREQ kHz	2ND LO FREQ MHz	CHANNEL XTAL fc = CHANNEL FREQ	MODE
3.0 kHz	1500	453.250	1.953250	fc + 1500 kHz	USB
3.0 kHz	1520	453.250	1.973250	fc + 1520 kHz	USB
3.0 kHz	1480	453.250	1.933250	fc + 1480 kHz	USB
3.0 kHz	1500	456.750	1.956750	fc + 1500 kHz	LSB
3.0 kHz	1520	456.750	1.976750	fc + 1520 kHz	LSB
3.0 kHz	1480	456.750	1.936750	fc + 1480 kHz	LSB
3.0 kHz	1400	453.250	1.853250	fc + 1400 kHz	USB
3.0 kHz	1420	453.250	1.873250	fc + 1420 kHz	USB
3.0 kHz	1380	453.250	1.833250	fc + 1380 kHz	USB
3.0 kHz	1400	456.750	1.856750	fc + 1400 kHz	LSB
3.0 kHz	1420	456.750	1.876750	fc + 1420 kHz	LSB
3.0 kHz	1380	456.750	1.836750	fc + 1380 kHz	LSB
2.1 kHz	1500	453.650	1.953650	fc + 1500 kHz	USB
2.1 kHz	1520	453.650	1.973650	fc + 1520 kHz	USB
2.1 kHz	1480	453.650	1.933650	fc + 1480 kHz	USB
2.1 kHz	1500	456.350	1.956350	fc + 1500 kHz	LSB
2.1 kHz	1520	456.350	1.976350	fc + 1520 kHz	LSB
2.1 kHz	1480	456.350	1.936350	fc + 1480 kHz	LSB
2.1 kHz	1400	453.650	1.853650	fc + 1400 kHz	USB
2.1 kHz	1420	453.650	1.873650	fc + 1420 kHz	USB
2.1 kHz	1380	453.650	1.833650	fc + 1380 kHz	USB
2.1 kHz	1400	456.350	1.856350	fc + 1400 kHz	LSB
2.1 kHz	1420	456.350	1.876350	fc + 1420 kHz	LSB
2.1 kHz	1380	456.350	1.836350	fc + 1380 kHz	LSB

Actual operating freq. Xstal Freq.
CH 1 - 2.670 MHz 4.070 MHz
CH 3 - 2.182 MHz 3.582 MHz
CH 6 - 3.235 MHz 4.235 MHz
CH 10 - 5.680 MHz 7.080 MHz

TABLE 4-3. CHANNEL STRIP DATA

BAND DESIGNATOR	RANGE (MHz)	JUMPER B
A1	1.6-2.0	IN
A2	2.0-2.5	OUT
B1	2.5-3.0	IN
B2	3.0-3.5	OUT
C1	3.5-4.5	IN
C2	4.5-5.5	OUT
D1	5.5-6.5	IN
D2	6.5-8.0	OUT
E1	8.0-10.0	IN
E2	10.0-12.0	OUT
F1	12.0-15.0	IN
F2	15.0-18.0	OUT
G1	18.0-21.0	IN
G2	21.0-24.0	OUT
H1	24.0-27.0	IN
H2	27.0-30.0	OUT

TABLE 4-4. CHANNEL KIT COMPONENTS

FREQUENCY MHz	BAND	CH STRIPS	CH OSC.	MATCHING NETWORK COMPONENTS		
				C6	C7	OUTPUT NETWORK
1.6-2.0	A	200390-T01	200580-1	C00014	C00011	210208-000
2.0-2.25	A	200390-T01	200580-1	C00014	C00009	210208-001
2.25-2.5	A	200390-T01	200580-1	C00014	C00009	210208-002
2.5-3.0	B	200390-T02	200580-1	C00013	------	210208-003
3.0-3.5	B	200390-T02	200580-1	C00012	------	210208-004
3.5-4.0	C	200390-T03	200580-2	C00011	------	210208-005
4.0-4.5	C	200390-T03	200580-2	C00016	------	210208-061
4.5-5.0	C	200390-T03	200580-2	C00016	------	210208-062
5.0-5.5	C	200390-T03	200580-2	C00009	------	210208-071
5.5-6.0	D	200390-T04	200580-2	C00009	------	210208-072
6.0-7.0	D	200390-T04	200580-2	C00008	------	210208-008
7.0-8.0	D	200390-T04	200580-2	C00017	------	210208-009
8.0-9.0	E	200390-T05	200580-2	C00007	------	210208-101
9.0-10.0	E	200390-T05	200580-2	C00007	------	210208-102
10.0-11.0	E	200390-T05	200580-2	C00006	------	210208-111
11.0-12.0	E	200390-T05	200580-2	C00006	------	210208-112
12.0-13.0	F	200390-T06	200580-3	C00018	------	210208-121
13.0-14.0	F	200390-T06	200580-3	C00018	------	210208-122
14.0-15.0	F	200390-T06	200580-3	C00005	------	210208-131
15.0-16.0	F	200390-T06	200580-3	C00005	------	210208-132
16.0-17.0	F	200390-T06	200580-3	C00019	------	210208-141
17.0-18.0	F	200390-T06	200580-3	C00019	------	210208-142
18.0-19.0	G	200390-T07	200580-4	C00020	------	210208-151
19.0-20.0	G	200390-T07	200580-4	C00020	------	210208-152
20.0-21.0	G	200390-T07	200580-4	C00004	------	210208-161
21.0-22.0	G	200390-T07	200580-4	C00004	------	210208-162
22.0-24.0	G	200390-T07	200580-4	C00004	------	210208-017
24.0-26.0	H	200390-T08	200580-4	------	------	210208-018
26.0-28.0	H	200390-T08	200580-4	------	------	210208-019
28.0-30.0	H	200390-T08	200580-4	------	------	210208-020

TABLE 4-5. MATCHING NETWORK COMPONENT SELECTION

FREQUENCY MHz	BAND DESIGNATOR	C6 (pf)	C7 (pf)	C12 (pf)	C13 (pf)	C8 (pf)	C9 (pf)	L6 TAP POSITION
1.6-2.0	A							
2.0-2.25	A	560	180	1200-2525	390	2000	1500	26-20
2.25-2.5	A	560	180	1200-2525	390	2000	1500	24-18
2.5-3.0	B	470	---	1200-2525	390	1500	620	24-17
3.0-3.5	B	390	---	800-1970	150	1500	330	22-16
3.5-4.0	C	330	---	615-1600	---	1500	----	19-15
4.0-4.5	C	220	---	615-1600	---	910	100	17-12
4.5-5.0	C	220	---	615-1600	---	910	100	18-13
5.0-5.5	C	180	---	425-1260	68	910	----	14-11
5.5-6.0	D	180	---	425-1260	68	910	----	15-12
6.0-7.0	D	150	---	425-1260	---	680	120	13-10
7.0-8.0	D	120	---	425-1260	---	680	22	11-8
8.0-9.0	E	100	---	180- 690	120	470	120	10-6
9.0-10.0	E	100	---	180- 690	120	470	130	10-7
10.0-11.0	E	68	---	180- 690	68	470	----	8-6
11.0-12.0	E	68	---	180- 690	68	470	----	9-7
12.0-13.0	F	56	---	180- 690	47	360	62	7-5
13.0-14.0	F	56	---	180- 690	47	360	47	8-5
14.0-15.0	F	39	---	100- 500	68	330	----	7-4
15.0-16.0	F	39	---	100- 500	68	330	----	8-5
16.0-17.0	F	33	---	100- 500	47	300	----	6-4
17.0-18.0	F	33	---	100- 500	47	220	68	6-4
18.0-19.0	G	27	---	100- 500	33	220	62	5-3
19.0-20.0	G	27	---	100- 500	33	270	----	5-3
20.0-21.0	G	22	---	100- 500	22	220	39	4-2
21.0-22.0	G	22	---	100- 500	11	270	----	4-2
22.0-24.0	G	CONSULT FACTORY						2-0
24.0-26.0	H	CONSULT FACTORY						2-0
26.0-28.0	H	CONSULT FACTORY						1-0
28.0-30.0	H	CONSULT FACTORY						0

CHAPTER 5
MAINTENANCE

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5.1 GENERAL.

5.1.1 Visual Inspection.

Periodically the covers should be removed from the chassis and the chassis should be visually inspected. Loose hardware should be tightened. Accumulated dirt should be removed, connections to the rear panel terminals should be secure and cables should be inspected for damage. The air screen, if the set has a fan, should be cleaned. The fingers on the plug-in pc boards should be cleaned using a suitable solvent. A general visual inspection should be made to locate any cracked or burned parts or any other evidence of physical damage.

5.1.2 Lamp and Fuse Replacement.

Lamp and fuse replacement should only be made using the types and ratings given in the parts list. Damage to the Transceiver could result if this recommendation is not followed.

5.1.3 Meter Monitoring.

The front panel meter may be used as a diagnostic tool to locate gross malfunctions or indicate that preventive maintenance is required. In the receive mode the meter indicates relative signal strength. Normally atmospheric noise will cause a deflection on the meter. A major change can indicate a change in receiver gain or the necessity of resetting AGC adjustments.

With A3S1 in the CATHODE CURRENT position and the Transceiver in the transmit mode, the meter indicates total cathode currents of the three 6146B driver tubes. When monitoring cathode current, a major change may indicate that a pa tube has deteriorated. Cathode current should never exceed full scale on the front panel meter. Idle current in ssb should be about 40 on the relative scale. The relative power position of A3S1 provides an indication of the peak power output and may also be used as a check of proper equipment operation.

5.1.4 Frequency Check and Netting.

If a precision frequency counter is available the crystal oscillators should be set as described in Section 4.7. There may be occasions however, when the Transceiver is communicating with a set that does not have the high stability of this Transceiver. If each set has a clarifier these may be adjusted so that each receives a proper signal.

If not, the channel oscillator frequency may be adjusted so that clear intelligence is obtained.

5.2 TROUBLE ANALYSIS.

5.2.1 Test Equipment.

A sophisticated Transceiver such as this unit would require a fairly extensive supply of test equipment if all of the circuits in the various modules were to be completely aligned. The modular construction of the Transceiver allows the equipment to be repaired with a minimum of difficulty. Modules may be easily replaced and sent back to the manufacturer for repair. Diagnostic testing is also simplified by the modular approach.

As a minimum, for diagnosing and testing, the following test equipment is suggested:

- Vacuum Tube Voltmeter - HP410-C or equivalent
- Dummy Load, 50 Ohm, 150 Watt
- Audio Oscillator

In addition, the following test equipment would be desirable:

- Signal Generator with Attenuator - HP606 or equivalent
- Oscilloscope - any oscilloscope, preferably with a frequency response capability in the HF range
- RF Voltmeter - Boonton 91DA or equivalent

5.2.2 Receiver Problems.

The most significant indication of a receiver problem is a loss of sensitivity. If the loss is only on one channel the trouble is either in the frequency generator board or in the RF Amplifier Module. Check for presence of channel injection signals to the RF Amplifier Module. If present, the trouble is in the RF Amplifier Module, probably in one of the channel strips. If the signal is absent on all channels, the trouble most likely is in the IF/Audio Board. This may be verified if a signal generator is available by injecting a modulated signal into J10 of the signal distribution board at a frequency of 1500 kHz (or alternate 1400 kHz). If no output is obtained from the speaker but AGC indication is obtained on the front panel meter the trouble is most likely in the Audio Output amplifier board. This may be verified by connecting an audio oscillator to the input of the Audio Output Board.

5.2.3 Transmitter Problems.

A complete loss of output on one of the channels should first be investigated by determining if the receiver is functioning properly. If it is then the trouble may be in the 12BY7A driver stage tuned circuit located on the channel strip card. Another cause may be the Pi Network. Inspect for broken wires, a bad wafer switch, or a cracked or shorted capacitor.

If the Transmitter does not function on any of the channels but does on receive the trouble is most likely in the RF Amplifier pc board. Inspect for broken or damaged components, measure voltages, replace tubes, FET's and perform other routine diagnostic tests to locate the trouble.

5.3 TROUBLESHOOTING PROCEDURE.

The following is a procedure that may be followed to evaluate the probable location of a suspected failure. Qualified personnel only should make adjustments if required. The indescriminate adjustment of Transceiver controls will only result in less than maximum performance.

5.3.1 Equipment (Typical Mfg. Model).

a. RF Signal Generator, 400 kc to 32 MHz (HP606).
b. Oscilloscope, 35 MHz (Tektronix 453).

c. AC/DC Voltmeter, 30 MHz (HP410C).

d. Dummy Load, 50 Ohm, 150 Watt.

e. Frequency Counter, 30 MHz, 50 MV Sensitivity.

5.3.2 Standard Tests.

a. Check all switches for proper location.

b. Check all channels for receiver noise (speaker) and transmitter power output (front panel meter indication on voice or AM). This also checks the normal transmit/receive function (front panel lights).

c. Check all fuses.

d. Check all connections including plug-in printed circuit boards.

e. Observe that all tubes have filament voltage by their glow.

f. Check all voltages as indicated at the bottom of page 5-9.

g. Check Carrier, 2nd LO and channel oscillator outputs and frequency (Frequency Generator Board).

h. Check for receiver sensitivity, all channels in ssb. (Clearly audible tone with 0.5μV input.) Also check AGC action to 100 mV input and observe front panel meter indication.

i. Key set, and check PA cathode idle current (zero signal transmit) for 40 on front panel meter with A3S1 (on bottom of RF Amplifier in cathode current position).

j. Check for power output, all channels (50 to 80V on voice or 1/2 to full scale on front panel meter.)

The preceeding tests will normally determine whether the problem is transmit or receive associated and will give an indication of the module at fault. To further pinpoint the area of difficulty the following may be performed.

5.3.3 Transmit Problem.

Remove A3A1P1 from A1J10 of the Signal Distribution Board and inject in A3A1P1 a 1500 (or alternate 1400) kHz 100% modulated IF frequency at -60 dBm (220μV). Check power output on all channels. If all channels are OK, the problem is the IF/Audio Board or audio input circuitry. If there is no output, the problem is either in the RF Amplifier or Matching Network. If there is no output on only one channel, the problem is in the channel tuning strip or the matching network for that channel.

5.3.4 Receive Problem.

In A1J10 mentioned above inject a 1 mV single frequency at the proper if (e.g., 1500 kHz) into the IF/Audio. An output in ssb verifies that the IF/Audio is performing normally and the problem is probably associated with the receive mixer in the RF Amplifier.

5.3.5 Troubleshooting Chart.

The following chart may be used as an aid in locating malfunctions.

SYMPTOM	LOCATION	PROBABLE CAUSE
Fails to turn on.	Power Supply, A5	1. F1 or A5F6 open. 2. A5J2, poor connection.
	Main Frame, A1	1. A1S2-C defective.
Low or no high voltage.	Power Supply, A5	1. A5C9, 10, 11 defective. 2. CR1 through CR8 defective. 3. Open A5T1 winding.
	Matching Network, A2	1. A2L4 open.
Low or no 250V	Power Supply, A5	1. A5CR9 through CR12 defective. 2. Open A5T1 winding. 3. A5L1 defective.
	Main Frame, A1	1. Defective contacts on A1K1.
	RF Amplifier, A3	1. A3C13 defective.
Low or no 12V regulated	Power Supply, A5	1. A5F5 open. 2. Loss of +250V. 3. AC standby line grounded (A5A1P2-4) 4. Regulator circuit defective (A5Q1) 5. Open A5T1 winding.
	Main Frame, A1	1. Short to ground on +12V distribution wiring.
Turns on but unable to transmit or receive (no oven or filament voltage)	Power Supply, A5	1. A5F4 open. 2. Open A5T1 winding.
	RF Amplifier, A3	1. A3A1V1, V2; A3V1, V2, V3 open filament.
No receive audio and no noise.	IF Audio, A4	1. Defective board.
	Freq Generator, A6	1. No injection oscillator outputs.
	Audio Output Amplifier, A1A2	1. Defective board.
	Audio Distribution, A1A1	1. Defective board.
No receive audio but normal receiver noise	Main Frame, A1	1. Defective A1K1.
	RF Amplifier, A3	1. Defective A3A1K1.

SYMPTOM	LOCATION	PROBABLE CAUSE
No receive audio and reduced receiver noise	RF Amplifier, A3	1. Defective A3A1 board.
	Freq. Generator, A6	1. No channel oscillator injection.
	IF/Audio, A4	1. Defective mixer or filter.
No channel oscillator output	Freq. Generator, A6 or Duplex Generator A8	1. Programming error 2. Defective crystal or oscillator.
No carrier oscillator output	Freq. Generator, A6	1. Mode is AM receive. 2. Defective oscillator or XTAL. 3. Programming error.
No 2nd LO oscillator output	Freq. Generator, A6	1. Defective oscillator or XTAL. 2. Programming error.
Channel oscillator frequencies 200 Hz to 2000 Hz too high	Freq. Generator, A6 or Duplex Generator, A8	1. Defective oven.
Won't key (transmit)	Main Frame, A1	1. Shorted keyline inhibit line.
	IF Audio, A4	1. Defective Q25 or associated circuitry.
	RF Amplifier, A3	1. Defective A3A1K1.
No transmit output	Main Frame, A1	1. Audio Distribution (A1A1) board defective. 2. A1K1 (ANT Relay) defective.
	IF/Audio, A4	1. Defective balanced modulator, U5. 2. No 2nd LO injection. 3. No carrier injection. 4. FL1 (SSB filter) defective. 5. Output mixer defective.
	RF Amplifier, A3	1. No channel oscillator injection. 2. A3A1K1 defective. 3. A3A1V1 or V2 defective. 4. A3V1, V2 or V3 defective. 5. A3A3 through A3A12, channel tune strips defective.

SYMPTOM	LOCATION	PROBABLE CAUSE
AM but no receive SSB	IF Audio, A4	1. No carrier injection. 2. Defective carrier gate.
	Freq. Generator, A6	1. Defective command diodes CR1 and 4.
No cathode current indication	RF Amplifier, A3	1. No 250V screen volts. 2. VR1 open. 3. No 750 plate volts. 4. Meter circuit defective.
High cathode current indication	RF Amplifier, A3	1. No grid bias. 2. C1 open. 3. Antenna open or short. 4. Oscillation - a) not neutralized, b) C10 shorted.
No TX indication in REL PWR position (S1)	RF Amplifier, A3	1. Shorted antenna. 2. Defective meter circuit.
No RX indication	IF/Audio, A4	1. Defective meter circuit, Q8.
Full scale meter deflection in RX	All	1. No +12V.
Speaker hum or buzzing	Power Supply, A5	1. C16 open.
	RF Amplifier, A3	1. C13 open.
High power output and low cathode current as measured on front panel meter	RF Amplifier, A3	1. Shorted C5, C8, or C11

5.4 ALIGNMENT PROCEDURE.

The following procedure contains all the steps required to completely align a transceiver. The procedure is arranged in a logical sequence which would be followed if every control in the transceiver were misaligned. As this is seldom the case in the field, only the procedures which directly affect the repaired circuit need be performed.

It will be noticed that some controls are preset and not mentioned again in the procedure. This is normal and these controls should remain in their pre-set positions.

Before performing any alignment procedures, the regulated 12 Volt supply voltage should be checked and the output levels of the frequency generator should be checked. It is acceptable, if the frequency generator output levels are up to 25% high, but if they are low they should be brought up to their specified level.

This procedure assumes that the transceiver has been roughly tuned, i.e., frequency sensitive jumpers cut or installed on the frequency generator and channel tune strips, tap location for each channel in the proper location in the matching network, and all fixed components which are frequency sensitive are the proper value.

Some components which are relatively broadband but may require special equipment are factory set and only have to be tuned if they or closely associated circuitry has been repaired or replaced. When these components appear in the procedure they will be marked with an asterisk (*). It is not recommended that these components be tuned unless repair or replacement has taken place or unless it is suspected that these components are seriously mis-tuned.

When connecting or disconnecting test leads to terminals or pins, the transceiver should be turned off and careful attention should be paid to ensure that adjacent terminals or pins are not shorted together by the test leads.

The following test equipment is recommended if all of the tests or alignments are to be performed:

a. RF Signal Generator - HP606B, or equivalent.

b. Peak Reading RF Voltmeter - HP410C, or equivalent.

c. Oscilloscope - 35 MHz bandwidth.

d. Frequency Counter, 0-30 MHz, 50mV sensitivity.

e. Dummy Load, 150 Watt rating.

It is recognized that while it is desirable that this test equipment be available, quite likely it will not be. Each individual situation will be different. It is obviously impossible to write a procedure that will cover all test equipment situations, however many adjustments may be made using only the indications available on the front panel meter and the audio output from the speaker. The following is a brief discussion of what might be accomplished using only the above.

Receive - If the transceiver is connected to an antenna, normally background noise is sufficient to give a tuning indication. The tuning adjustments on the channel tune boards may be peaked listening to background noise or, if the background noise is strong enough, observing the front panel signal strength meter. The if tuned circuits are relatively broad and do not re-

quire critical adjustment. These may be set as above if a replacement has been made. The criteria should be that if the set has good inherent sensitivity and clarity of reception it should not be readjusted. The channel oscillator tuning adjustments may be adjusted when listening to a signal from a transceiver of comparable stability by adjusting for the most natural sounding speech.

Transmit - In transmit a signal for peaking the transmitter tuned circuits may be artificially created (in the am mode) by setting A4R3, the second l.o. injection level, to obtain a front panel indication of about 1/4 scale. A4R3 should be re-set approximately 3/4 cw when adjustments are completed.

The am carrier level may be set by adjusting A3A2C9 for mid-scale (approximately 44 Volts output) on the front panel meter. The current limit control, A3A2R50, may be set by loudly whistling into the microphone with the transmit audio set maximum cw for several seconds at a time and adjusting for a meter indication of approximately full scale.

Other innovations may be made if the purposes of the controls are clearly understood. Reference should be made to the theory of operation and schematics.

When making tuning adjustments to the channel tune pc board assembly and a duplex channel is being aligned, it is essential that the receive adjustments be made first if the transmit frequency is below the receive frequency. If the reverse is true, the transmit adjustments should be made before the receive adjustments.

5.4.1 Power Supply A5 Adjustment.

The only adjustable voltage in the AC Power Supply is the regulated 12 Vdc supply. To adjust this supply voltage, connect a dc voltmeter between XA4-11 and ground, set the function switch to RECEIVE, and adjust R15 on the AC Power Supply for +12.6 Volts as read on the dc voltmeter.

NOTE

The DC Power Supply is adjusted and sealed at the factory; do not reset.

The remaining power supply outputs are not adjustable; but if trouble is suspected in the power supply, they may be measured as follows.

The voltages given below are obtained when the supply is connected to a 117 Vac source. All plugs and receptacles of the supply should be mated with corresponding receptacles of the radio, and the radio set to the receive mode. All voltages are referenced to ground.

TEST POINT LOCATION	VOLTAGE
Anode of power output tubes	+750 ± 75 Vdc
390K resistor R32 at E11 on Power Control Board A3A2	+240 ± 25 Vdc
Power Control Board A3A2R5 (lead toward center of board on 5.6K, 1/2W resistor)	-120 ± 20 Vdc
V1 Pin 7	12.6 Vac Rms ± 0.6V

5.4.2 Frequency Generator A6 Adjustments.

5.4.2.1 General.

The Frequency Generator PC Board contains all the crystals and oscillators required to operate the transceiver. The adjustments on this board include the oscillator levels and the oscillator frequencies.

The level adjustments may be accomplished one minute after the transceiver has been switched to the receive mode. The frequency adjustments should be done only after a 30 minute warm-up period. As all oscillators are crystal controlled, they normally are not far enough off frequency to affect any of the tuning adjustments which follow in this procedure. Therefore, if desired, the complete transceiver tuning procedure may be adjusted as the last step.

Since there are three types of Frequency Generator Boards, there are three versions of the basic procedure.

5.4.2.2 Simplex Frequency Generator PC Board A6 Adjustments.

The Simplex Frequency Generator Board channel oscillators are at the same frequency on receive and transmit and therefore all adjustments may be made in receive. Before making any adjustments it is essential that it be known what the correct crystal output frequencies are. If they are not known they may be determined by removing the oven cover and noting the crystal frequencies marked on the crystals.

a. Connect the ac probe of the HP410C from ground to XA6-2. Set the function switch to receive, allow at least 30 minutes warm-up. Switch the Voice Privacy off if transceiver has a Voice Privacy option. Set R30 Carrier Level to mid-range. Switch to usb, adjust R15 for 140 mV output as read on the HP410C. Switch to lsb, adjust R24 for 140 mV output. Connect frequency counter from ground to XA6-2. Switch to lsb, adjust C17 for correct frequency. Switch to usb, adjust C7 for correct frequency. Ref. Table 4-2 for frequencies available.

b. Connect the ac probe of the HP410C from ground to XA6-15. Switch clarifier off if the transceiver has the clarifier option. Adjust R46 for 210 mV output. Connect frequency counter from ground to XA6-15. Adjust C33 for correct frequency. Switch to lsb, adjust C26 for correct frequency. Ref. Table 4-2.

c. Connect the frequency counter from ground to XA6-30. Starting with the channel switch in channel 1, adjust all trimmer capacitors for the correct output frequency. These capacitors are accessible through holes on the side panel and are clearly marked. Remove the frequency counter and connect the ac probe of the HP410C to XA6-30. Adjust R4 to obtain an output of 140 mV on the lowest output channel.

5.4.2.3 Marine Frequency Generator PC Board A6 Adjustments.

The Marine Frequency Generator PC Board channel oscillators are used for both transmit and receive if the channel is a simplex channel. If the channel is a duplex channel, the A6 board normally has the transmit crystals and the A8 board (Duplex Frequency Generator PC Board) the receive crystals.

Knowledge of the channel oscillator crystal frequencies is essential before adjustments may be made. If not known they may be determined by removing the oven cover.

a. Connect the ac probe of the HP410C from ground to XA6-2. Set the function switch to RECEIVE. Allow at least 30 minutes warm-up. Set R16 to mid-range. Adjust R15 for 140 mV output. Connect frequency counter from ground to XA6-2. Adjust C7 for correct frequency. Ref. Table 4-2.

b. Connect the ac probe of the HP410C to XA6-15. Switch the clarifier off if the transceiver has a clarifier option. Adjust R26 for 210 mV output. Connect the frequency counter from ground to XA6-15. Adjust C17 for the correct frequency. Ref. Table 4-2.

c. Connect the frequency counter from ground to XA6-30. If the transceiver has no duplex channels, set the function switch to RECEIVE. Starting with channel 1, adjust all trimmer capacitors for the correct output frequency. These capacitors are clearly marked and are accessible through holes in the side panel.

   If the transceiver has duplex channels, the frequencies must be adjusted in the transmit mode as follows:

   (1) Remove A3A1P1 (located on the signal distribution board) from A1J10. This prevents the PA from putting out power when the transceiver is keyed.

   (2) Switch the function switch to TRANSCEIVE. Key the transmitter, adjust all trimmers for the correct output frequency. Unkey transmitter, replace A3A1P1 in A1J10.

d. Connect the ac probe of the HP410C to XA6-30. If the transceiver has no Duplex Frequency Generator PC Board (A8), the channel oscillator output level is adjusted as follows:

   (1) Switch the mode switch to RECEIVE. Set R4 to obtain an output of 140 mV on the lowest output channel.

   If the transceiver has a Duplex Frequency Generator PC Board (A8), the channel oscillator output level is adjusted as follows:

   (1) Turn A8R4 fully clockwise. This is located on the Duplex Frequency Generator Board.

   (2) Remove A3A1P1 from J10. Set transceiver to Channel 1. Key transmitter, note output level. Repeat for all channels, noting the output level on all channels. Adjust R4 for 140 mV on the lowest output channel.

5.4.2.4 Duplex Frequency Generator PC Board A8 Adjustments.

The Duplex Frequency Generator PC Board normally has the receive crystals in a duplex transceiver. Knowledge of the crystal frequencies is essential before adjustments may be made. If not known they may be determined by removing the oven cover.

a. Insert A8 in card extenders. Connect the frequency counter from ground to XA6-30. Set the function switch to RECEIVE, allow at least 30 minutes warm-up. Adjust the appropriate trimmer capacitors for the correct output frequency on each duplex channel.

b. Adjustment of R4, the output level adjust, is made as a part of the adjustments covered in 5.4.2.3.

5.4.3 RF Amplifier and Matching Network Adjustments.

5.4.3.1 General.

RF Amplifier Assembly A3, in the transmit mode, takes the if signal from IF/Audio Board A4, amplifies it, converts it to the channel frequency, amplifies this, and presents it to the three power output tubes. In this procedure, the if signal will come from a signal generator rather than the IF/Audio Board, so ppc action will not take place, and so channel gains may be set with an exact input level to the RF Amplifier Assembly.

In the receive mode, the RF Amplifier takes the received signal, amplifies or attenuates it according to the agc voltage, converts it to the if frequency, and presents it to the IF/Audio Board. All tuned circuits in the receive path are also used in the transmit path, and therefore the Transceiver will be tuned in transmit only.

5.4.3.2 Cathode Current Adjustment.

a. Connect the 50Ω, 150 Watt dummy load to rf output connector J2 on the rear panel. Connect the ac probe of the peak reading rf voltmeter across the dummy load, using a T-probe or suitable adapter.

b. Disconnect A3A1P1 from A1J10. A1J10 is located on the bottom of the signal distribution pc board.

c. Switch the function switch to TRANSCEIVE.

d. Switch Cathode Current/Rel Power Switch A3S1 to Cathode Current.

e. Key the Transceiver. Keying may be accomplished by the use of a microphone or by connecting A1A1P12 to ground. If the latter is used, the Transceiver may be unkeyed, when necessary, simply by switching the function switch to RECEIVE.

f. Adjust A3A2R4, the PA Bias Control, for a reading of 40 on the Transceiver's front panel meter.

g. Return A3S1 to the Relative Power position.

5.4.3.3 RF Tuning and Gain Adjustments.

If the Transceiver is a marine or duplex type, or if the Channel Tune Strips have optional image traps, refer to tuning procedure in Chapter 4. Otherwise, for a standard Transceiver, perform the following simplified procedure.

a. Disconnect A3A1P1 from J10 on the Motherboard.

b. Connect an rf signal generator to A3A1P1, the if input to the RF Amplifier. Set the frequency of the signal generator to the if frequency of the Transceiver. If the if frequency is unknown, it may be determined by subtracting the frequency of the usb carrier crystal from the frequency of the usb 2nd local oscillator crystal.

c. Switch to Channel 1.

d. Key.

e. With no signal generator modulation, adjust the rf output level of the signal generator for an output indication on the rf voltmeter connected to the dummy load. Do not exceed 40 Volts.

f. Adjust L2, L3, and L4 of A3A3 (the channel 1 tune strip) for a maximum

output indication. As these coils are peaked, it may be necessary to reduce the rf signal generator level to keep the output at the dummy load under 40 Volts.

NOTE

The higher frequency channel tune strips have the possibility of being tuned to the image. The image frequency is the channel crystal frequency PLUS the if frequency rather than the channel crystal frequency MINUS the if frequency. If a channel tune board or one of its coils has been replaced, the slugs in L2, L3, and L4 should be pre-set to their lowest frequency position (slugs in the center of the coil body), then turned out until the tune point has been found. If the channel tune strip has been tuned to the wrong frequency, it will be noticed later when a receive sensitivity check indicates a channel with very poor sensitivity.

g. Tune T1, T2, and T3 of the A3A1 PC Board for a maximum output indication.

h. Adjust the channel one matching network capacitor A2C13 for a maximum output indication.

i. Adjust the signal generator level to -60 dBm (224μV). Adjust R2 on the channel one tune strip for 40 Volts output at the dummy load.

j. Repeat steps f, h, and i for every channel.

k. Reconnect A3A1P1 to J10.

l. Remove the channel oscillator injection by removing A3A1P2 from J9. Connect the signal generator to A3A1P2. Set the channel switch to the highest frequency channel. Set the signal generator frequency to the transmitter output frequency, not the normal channel oscillator frequency. Set the signal generator level to 0 dBm (226 mV). Connect the dummy load and HP410C to J2. Set the function switch to TRANSCEIVE, and key transmitter. Adjust balance control R21 for minimum output. Re-connect A3A1P2 to J9.

5.4.4 IF/Audio Board A4 Adjustments.

The IF/Audio Board is a very complex board and many of the controls interact with each other. If any controls or circuits associated with these controls have been repaired or replaced, the entire IF/Audio Board adjustment procedure should be performed.

a. Remove the IF/Audio PC Board from the Transceiver, and re-install it on card extenders.

b. Initial Settings

If factory settings of potentiometers have not been changed, do not disturb them. If repair or misalignment has occurred, set potentiometers as follows (view from top or front of Transceiver).

R3	2nd LO Level	Mid-Range
R26	S Meter Limit	Mid-Range
R35	IF AGC Threshold	Maximum ccw
R55	AGC Linearity	Mid-Range
R64	Audio Level	3/4 cw
R105	Carrier Balance	Mid-Range
R124	AGC Attack Time	2/3 cw
R127	Noise Limiter Threshold	Mid-Range
R32	Meter Zero	Mid-Range

c. Turn the function switch to STBY and the mode switch to AM. (If set has no mode switch, set channel selector to any am channel.)

d. Check mechanical zero of panel meter, and adjust if necessary.

e. Turn Transceiver function switch to RECEIVE, and allow set to warm up for 5 minutes.

f. Adjust R32 ccw until indication is noted on panel meter; then adjust cw until meter just reaches zero. (Do not adjust R32 further cw than necessary to reach zero.) This sets the RF Amplifier bias to approximately -0.6 Volts as measured on XA4-36.

g. Connect oscilloscope to audio output terminals (pin 13 on IF/Audio PCB or terminal E1 on Audio Output PC Board). Disable squelch if used, and adjust front panel receive audio potentiometer for visual indication.

h. Disconnect the 50Ω dummy load. Connect signal generator to antenna connector J2, and adjust it to channel frequency. (Accurate frequency adjustment can be made by switching to usb mode and adjusting signal generator, with unmodulated signal, for zero beat.)

i. Adjust signal generator for 30%, am, 1000 Hz modulation. Adjust level until 1000 Hz signal is just audible. Observe on oscilloscope.

NOTE

If no signal can be heard with 1000 μV input, adjust R3 fully cw. Tune T3 through range.

NOTE

When performing steps j. through n. below, keep the signal generator level below the agc threshold level (no indication on the front panel meter).

*j. On IF/Audio PC Board, adjust R3 ccw until audio signal decreases.

*k. Tune T3 for maximum audio signal.

*l. Tune T1, T8, and T9 for maximum audio signal.

*m. Adjust R3 cw until there is no further increase in audio signal, then adjust about 15° further cw.

*n. Adjust T7, T4, and T5 for maximum audio signal.

*o. Increase signal generator level until panel meter reads about 3 S-units. Adjust T6 for maximum panel meter or minimum audio output indication.

p. Change mode switch to usb.

q. Adjust signal generator for 100 μV, cw, and adjust frequency for approximately 1000 Hz audio signal. Note the peak-to-peak audio level on oscilloscope.

r. Reduce signal generator level to 1 μV. Adjust R35 for one-half of level noted in step p.

NOTE

If proper level cannot be attained by adjusting R35, set R35 for maximum level and adjust R127 for proper level.

s. Change mode switch to AM. Adjust signal generator for 0.5 Volts, 30% modulation.

t. Adjust R55 for -20V on pin 36. (This is a high impedance point, and a dc oscilloscope or vtvm must be used.) If audio waveform is distorted, readjust R55 for minimum distortion.

u. Increase input to 1V, and adjust R26 for full scale from panel meter deflection.

v. Decrease input to 100μV, and adjust R64 for 2.2V p-p on the oscilloscope.

w. Switch the Function switch to OFF. Reinstall the IF/Audio PC Board into the Transceiver. Disconnect the signal generator and connect the dummy load to J2. Switch the Function switch to TRANSCEIVE and the Mode switch to USB. Key the Transceiver and adjust A4R105 (Carrier Balance) for minimum output. As minimum output is approached, it will be necessary to switch the RF voltmeter to the 1V scale.

5.4.5 Power Control PC Board (A3A2) Adjustments.

a. Connect dummy load and HP410C as in 5.4.3.2. Remove A3A1P1 from A1J10. Set Function switch to TRANSCEIVE. Set to any channel. Switch A3S1, the REL PWR/CATH I switch, to the CATH I position. Key transmitter. Adjust the idle current control, R4, for a reading of 40 on the front panel meter. Switch A3S1 back to the REL PWR position unless step (b.) is to be done. Reconnect A3A1P1.

b. Connect an audio oscillator (set for 1 kHz output) to XA4-21. The average current limit circuit will limit cathode current to any desired level. R50 adjusts that level. Normally, this circuit is set to limit the cathode current to full scale on the front panel meter; however, it may be set lower if desired. This circuit is relatively slow acting and takes 2 to 3 seconds to react to an overload, which means that R50 must be set to a position, the output level observed, and then to a new position until the desired level is obtained. This may be accomplished as follows:

1. Set R50 maximum counterclockwise.

2. Set Function switch to TRANSCEIVE. Key transmitter. Set the audio oscillator level 20 dB above the level which gives 32V output on the HP410C. Rotate R50 clockwise a few degrees, and observe what the output voltage settles to on the HP410C. Keep rotating R50 clockwise until the front panel meter reads full scale.

3. Return meter switch A3S1 to REL PWR position.

c. Connect the dummy load and HP410C as in 5.4.3.2. Switch the mode switch to AM or, if transceiver is programmed, switch to any am channel. Set Function switch to TRANSCEIVE. Key transmitter. Adjust C9 for 43 Volts (37 Watts) output on HP410C.

d. If the Transceiver is to be operated in a reduced power mode, R8 may be adjusted to limit the output power as desired (AM or reduced power mode only). Otherwise, R8 should be set to full ccw.

5.4.6 Motor Control Wafer Alignment.

The following is the procedure to align the motor control wafer with the channel switch position. Remove the matching network module from the Transceiver. Remove the center shaft of the matching network and place it between the motor drive assembly and the PA module. Loosen the two screws supporting the switch assembly and rotate until the tab on the rotor of the front wafer is centered about the stator contact on which it is positioned.

CAUTION

Do not rotate the channel knob or matching network wafers while the shaft is disconnected. A 180 degree misalignment may result. The symptom will be, when in remote and selecting a channel, the Transceiver will program to the wrong channel.

Tighten the screws supporting the switch assembly and go to remote. Select a channel and observe where the front wafer stops. If it does not stop centered about a stator contact loosen the two screws supporting the rear wafer. Reposition this wafer until the front wafer stops centered about a stator contact. Tighten the supporting screws and reassemble the Transceiver.

5.5 PERFORMANCE TESTS AND ADJUSTMENTS.

5.5.1 General.

Alignment and adjustments should be made only when necessary and only according to instructions. There are many circuits which are not merely adjusted for maximum output but for other and more critical parameters. Caution should be observed at all times to avoid contacting high voltages. In particular the PA screens should be left on at all times unless a repair is being made in that section. +240V is present, however, in the RF Amplifier module, and care should be taken to avoid contact.

5.5.2 Receiver Gain and Sensitivity.

5.5.2.1 IF/Audio Board 1A4.

The following adjustments may be periodically made:

a. Meter Zero - Remove the antenna and terminate the antenna jack with 50Ω termination. With the Transceiver in the lsb or usb receiver mode, adjust 1A4R32 for 0 indication on the front panel meter. Replace the antenna. The front panel meter will normally indicate due to atmospheric noise.

b. Second LO Level - 1A4R3 controls the drive to the balanced 1500/455 kHz balanced mixer. This is a factory adjustment but if a repair has been made in this circuit, it should be adjusted to the point where the receive gain no longer increases. A steady signal must be present.

c. AF Level - 1A4R64 controls the audio level into the audio output amplifier. It should be set so that no apparent distortion occurs under strong signal conditions when the front panel receive audio level control is fully on.

5.5.2.2 Frequency Generator Board 1A6.

a. Channel Oscillator Level - This adjustment, 1A6R4, should not be normally necessary, but if a repair has been made it should be set to give a nominal output level from the 1A6 module of 400 mV, peak-to-peak.

b. Carrier and 2nd LO Oscillator Levels - Adjustments should only be made if a repair has been made. Carrier level is adjusted for 400 mV p-p, and 2nd 2nd LO level is 600 mV p-p. Refer to appropriate schematic for R designators.

5.5.4 RF Amplifier Module 1A3.

There are no receive adjustments to be made in the RF Amplifier module other than the tuning on the channel strips which was previously covered in Paragraph 4.7 and the tuning of T1 and T2 which are factory adjustments.

5.5.5 Transmitter Gain and Power Output.

The normal gain and tuning adjustments for the transmitter are covered in Paragraphs 4.7 and 5.4; however, there are certain adjustments that may be periodically necessary.

a. PA Bias - With the transmitter keyed in the ssb mode, and the transmit audio at minimum, adjust A3A2R4, the PA bias control, for a reading of 50 on the front panel meter. 1A3S1 must be in the cathode current position. This should correspond to 25 mA per tube. The individual currents may be measured by measuring the voltage at each cathode and computing the current. If any of the tubes are significantly different it may indicate a tube should be replaced.

b. Carrier Balance - This adjustment can only be made if some means of monitoring the carrier is available. Another receiver tuned to the carrier frequency might be used or an oscilloscope coupled to the grid of the PA tubes might be used. This adjustment should only be made if it has been determined that the carrier has been unbalanced by a necessary repair or an accidental misadjustment of the carrier balance control, 1A4R105. If it is certain that a reliable indication of carrier balance is available, 1A4R105 should be adjusted for minimum output.

c. AM Carrier Level - A3A2C9 sets the level of the AM carrier on transmit. It should be set to a level of half scale on the front panel meter with 1A3S1 in the Relative Power Output position.

d. Peak Power Output - The front panel meter gives a relative indication of peak power output but on voice peaks it will not respond quickly enough to indicate when full power output is obtained. It is set in the factory to indicate full scale with a two-tone signal of 150 Watts p.e.p. On voice it will normally indicate about 2/3 scale when full power output is obtained.

5.6 DISASSEMBLY OF TRANSCEIVER.

The Transceiver is designed so that it can be completely disassembled for troubleshooting or parts replacement using a cross-recessed screwdriver. The sequence of disassembly is important and should be strictly followed to prevent equipment damage.

5.6.1 Power Plug and Top Cover.

a. Remove the power cord at the rear of the set.

b. Remove the six (6) screws holding the top cover and lift the cover up and off.

5.6.2 PC Boards and Retainer.

a. Loosen two (2) screws either side of the retainer. Lift up to remove. DO NOT REMOVE SCREWS.

b. Remove two (2) PC Board retaining straps if provided.

c. Remove each PC Board by grasping the guides and lifting upward.

5.6.3 Bottom Cover.

Remove twelve (12) cover screws, and remove the cover.

5.6.4 Power Supply.

a. Unplug the octal plug.

b. Unplug the 15 pin harness connector.

c. Unplug the in-line motor/fan connector.

d. Remove the four (4) screws securing the bottom of the power supply.

e. Lift the power supply out through the TOP of the set.

5.6.5 Matching Network.

a. Remove the four (4) screws holding the top screen and lift screen off.

b. Remove the four (4) screws holding the bottom screen and lift screen off.

c. Remove the two (2) outside screws holding the top bracket. Unplug the high-voltage pin connector on the plate choke, neutralization pin connector on the wall of the PA, and the three (3) tube caps.

d. Remove the coupling screw from the switch shaft. Rotate channel knob so that slot on coupling is vertical. Push shaft to maximum forward position.

e. Unplug the ppc plug, the relative power plug on the wall of the PA, and the quick disconnect rf output connector.

f. Remove the four (4) screws holding the network on the center portion of the set.

g. Remove the four (4) screws holding the network to the side panel and lift the network out through the TOP of the set.

5.6.6 RF Amplifier.

a. Unplug the Channel Oscillator injection plug and the if input plug from the signal distribution board.

b. Unplug the 15 pin pc harness plug.

c. Unplug the rf input plug kW ppc input (if present), and the 4 pin plug.

d. Remove the front panel coupling screw and slide the coupling forward on the switch shaft.

e. Remove six (6) screws holding the amplifier to the center partition of the set.

f. Remove eight (8) screws holding the amplifier to the side panel and the bottom ground strap to the rear panel (two (2) screws) if present and lift the amplifier out through the BOTTOM of the set.

5.6.7 Front Panel.

a. Remove the center partition retaining screw.

b. Turn the set to normal position.

c. Remove the six (6) screws from the side panels and carefully rotate the front panel face down.

5.7 CONNECTOR REPAIR.

A special technique is used to disassemble and repair the rectangular black plastic connectors used on the rear of the equipment.

5.7.1 Tools.

Part Number MP0504 Contact Removal Tool is used to remove pins from their shell.

5.7.2 Connector Arrangement.

Male and female connectors can be used as either jacks or plugs, depending on whether they are fastened to a chassis or to a cable clamp/shell on a cable. A female connector, such as part number J00253, has a full body (contacts completely enclosed on the sides) and uses bifurcated (split) contacts as shown on this page. A male connector, such as part number P00253, has a body which is recessed to expose pins which are solid blades (not bifurcated). A spring wing on the side of the contact snaps in place when the pin is installed in the connector shell.

5.7.3 Removal of Pins.

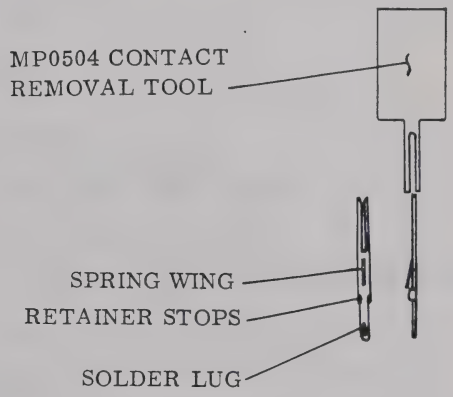
Male and female pins are easily removed with the MP0504 tool. Insert the bifurcated end of the tool over the mating end of the connector pin as illustrated on this page. Press the tool into the cross recess in the connector shell lightly until you feel the spring wing compress. DO NOT FORCE PIN OUT WITH TOOL. With wing compressed, the pin is withdrawn by pulling gently on its wire lead or pulling on the pin with a pair of needle-nose pliers.

5.7.4 Connecting Wires to Pins.

Strip wire 1/8 inch, form loop in wire, and crimp loop over contact lug with wire in line with pin. Solder sparingly.

5.7.5 Insertion of Pins.

Push pin firmly in place in shell until spring wing snaps in place. If a pin is reused, it may be necessary to bend the spring wing out slightly before installation.



5.8 FUSE AND LAMP INDEX.

Most of the fuses for the set are located in the Power Supply Assembly, and information is contained in Chapter 11 for AC Power Supplies and Chapter 12 for DC Power Supplies concerning replacement fuses. A primary power fuse is mounted on the rear panel, and its value is marked on the panel and in the parts list in Chapter 6.

Lamps are located on the A1A1 Audio Distribution Board behind the front panel, and replacements are listed in the parts list for that assembly in Chapter 6.

CHAPTER 6
MAIN FRAME

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Paragraph	Title
6.1	Functional Description
6.2	Signal Flow Discussion
6.3	Main Frame Configuration
6.4	Audio Distribution Board A1A1
6.5	Remote Options
---	Parts List

Figure	Function
6-1	Block Diagram
6-2	Major Assembly Locations
6-3	Signal Distribution Motherboard
6-4	Audio Distribution Board A1A1
6-5	Main Frame Schematic Diagram
6-6	Remote Control of Power, Simplified Schematic
6-7	Channel Control Switches
6-8	Microphone & Handset Wiring Diagrams
6-9	Microphone Amplifier Circuits, Schematic Diagrams

6.1 FUNCTIONAL DESCRIPTION.

The radio described in the following sections is a dual conversion superheterodyne transmitter-receiver capable of operation in single sideband and amplitude modulation voice communication modes and cw or frequency shift keying data modes. Up to ten crystal controlled channels are available in both simplex and half duplex. Power output is 150 Watts p.e.p. or 100 Watts average.

6.2 SIGNAL FLOW DISCUSSION.

Refer to Figure 6-1, Transceiver Block Diagram, for the subsequent discussion.

6.2.1 Receive.

The received signal from the antenna is routed through A1K1, the antenna switching relay, through A3A1K1, the tr relay to A3A1V1, the rf amplifier. V1 is also used in the transmit function as an amplifier. A tube is used because of its superior signal handling capability and its availablility resulting from use in transmit. A transistor fet "front end" is available as an option. A3A1V1 drives A3A1Q1, the receive mixer, the output of which is a 1.5 MHz or alternate intermediate frequency. Conversion to the 455 kHz if, and then audio detection, takes place in IF/Audio Module A4 via CR1-CR4, FL1 or FL2,

U1-U3, and audio amplifiers Q17-Q23. The speaker amplifier is A1A2.

6.2.2 Transmit.

Input audio signals are converted to the 455 kHz if and filtered by A4U5 and A4FL1. Bi-directional mixer A4CR1-CR4 up-converts to 1.5 MHz or alternate if, which is supplied to amplifier A3A1Q3 and then to transmit mixer A3A1U1. Rf Amplifier A3A1U2 provides necessary drive, through A3A1K1, the tr relay, to A3A1V1, A3A1V2, and power amplifiers A3V1-V3. Matching Network A2 provides matching between the plates of the power amplifier and a 50 Ohm antenna. Rf power to the antenna connector is controlled by the antenna switching relay A1K1.

6.3 MAIN FRAME CONFIGURATIONS.

The main frame contains all wiring and circuitry necessary to interface Transceiver modules A2 through A11.

6.3.1 Six Channel Transceiver.

The basic parts of the main frame are shown on Figure 6-5, Main Frame Interconnection Diagram. Important sections and their functions are described beginning with paragraph 6.3.4.

6.3.2 Ten Channel Transceiver.

In terms of additional components or wiring, there is no difference between the six and ten channel transceiver. The difference occurs in the plug-in modules A2, A3, and A6.

6.3.3 Ten Channel Transceiver with Half-Duplex Function.

For ten channel duplex operation, a modified Signal Distribution Motherboard is supplied. For duplex operation, the Voice Privacy option is not available. In its place (and location), an additional ten crystal oven and Duplex Frequency Generator Board A8 is inserted. Channel information is obtained from the same channel switch wafer, A1A1S1. Channel information may be programmed to accomodate either simplex or half-duplex on any channel. Mode may also be programmed to channel selection.

6.3.4 Main Frame Electronics Front Panel.

The front panel contains all necessary operator controls and inputs, including Audio Distribution PC Board A1A1 and Audio Output PC Board A1A2. Controls, their function and purpose, are discussed in paragraph 3.2.1.

6.3.5 Main Frame Electronics Rear Panel.

Additional components and input/output functions are included on the rear panel. All terminal strips and connectors providing for remote inputs and antenna coupler channeling information are also located there. Components on the rear panel are shown on the Main Frame Schematic Diagram at the rear of this chapter, including A1K1, the antenna switching relay, and optional A1K2, the remote motor switching relay. (The schematic diagram bound in this manual varies with the particular type of set ordered.)

6.3.6 Signal Distribution Printed Circuit Board.

The signal distribution board provides all interfaces between modules, front panel, and rear panel. The necessary basic plug-in modules on this board are the Frequency Generator (A6) and the IF/Audio (A4) modules. All options, with the exception of remote, plug into this board.

6.4 AUDIO DISTRIBUTION PRINTED CIRCUIT BOARD A1A1.

The Audio Distribution Board, A1A1, is shown schematically on the first sheet of the main frame schematic diagram. The Audio Distribution Board accepts local microphone, remote, and phone patch audio inputs; and by TRANSMIT AUDIO level control R2 it sets the drive level to the transmit balanced modulator. Receive audio, as set by Receive Audio control R1, is also supplied to the local speaker, handset, remote, or phone patch. Remote and phone patch operation occurs at the balanced 600Ω, 0 dBm level through T1 and T2. Remote audio is a four-wire system, whereas the phone patch provides switching of a two-wire input. Phone patch transmit also keys the transmitter. Board A1A1 also contains the TRANSMIT and RECEIVE lights, which indicate the status of the transceiver. These lights also serve for receiver tuning in the fsk mode. Channel oscillator switching information is derived from S1, a part of the channel selector switch.

Where automatic mode programming is provided, selection of any mode may be preselected on a channel basis. Programming is accomplished as follows (refer to schematic diagram). (P)1 through (P)10 on the program matrix designate channel position, and (P)13 through (P)18 designate mode. By soldering jumpers from (P)1 through (P)10 to (P)13 through (P)18, channel-mode programming is set. For example, a jumper from (P)1 to (P)16 provides the am mode in channel 1. (P)11 and (P)12 are test functions that may be established by the placement of a jumper to chassis ground. Operation of mode selection is as follows:

a. LSB: +12V on (P)13 activates lsb oscillators on the A6 Frequency Generator Board (206/210 only) via CR11.

b. USB: (reduced carrier, -16 dB): +12V on (P)14 activates the usb oscillators on Frequency Generator Board A6 via CR38.

c. USB: (suppressed carrier, -50 dB): +12V on (P)15 activates the usb oscillators on Frequency Generator Board A6 via CR14.

d. AM: (carrier -3 dB to -6 dB): +12V on (P)16 activates the carrier reinsertion gate on IF/Audio Board A4, the usb oscillators on Frequency Generator Board A6 via CR15, and receive carrier injection disable gate on Frequency Generator Board A6 via Q4 and CR14. Q4 is on in receive only.

e. CW: +12V on (P)17 activates the cw oscillator (A7A1) via CR18, increase peak power control (ppc) time constants on PPC Control (A3A2) Board via CR21, activates the usb oscillators on Frequency Generator Board A6 via CR16, and disables the microphone input via CR21, R8, and Q1.

f. FSK: +12V on (P)18 activates FSK Board A9 via CR19, increases ppc time constants on PPC Control (A3A2) Board via CR22, activates the usb oscillators on Frequency Generator Board A6 via CR17, disables the microphone input via CR22, R8, and Q4, and turns Q3 off via CR29 and Q2, thereby providing RECEIVE/TRANSMIT lamp control to FSK Board A9 for tuning and indication purposes. +12V is also supplied to the lamps via CR34 and CR35.

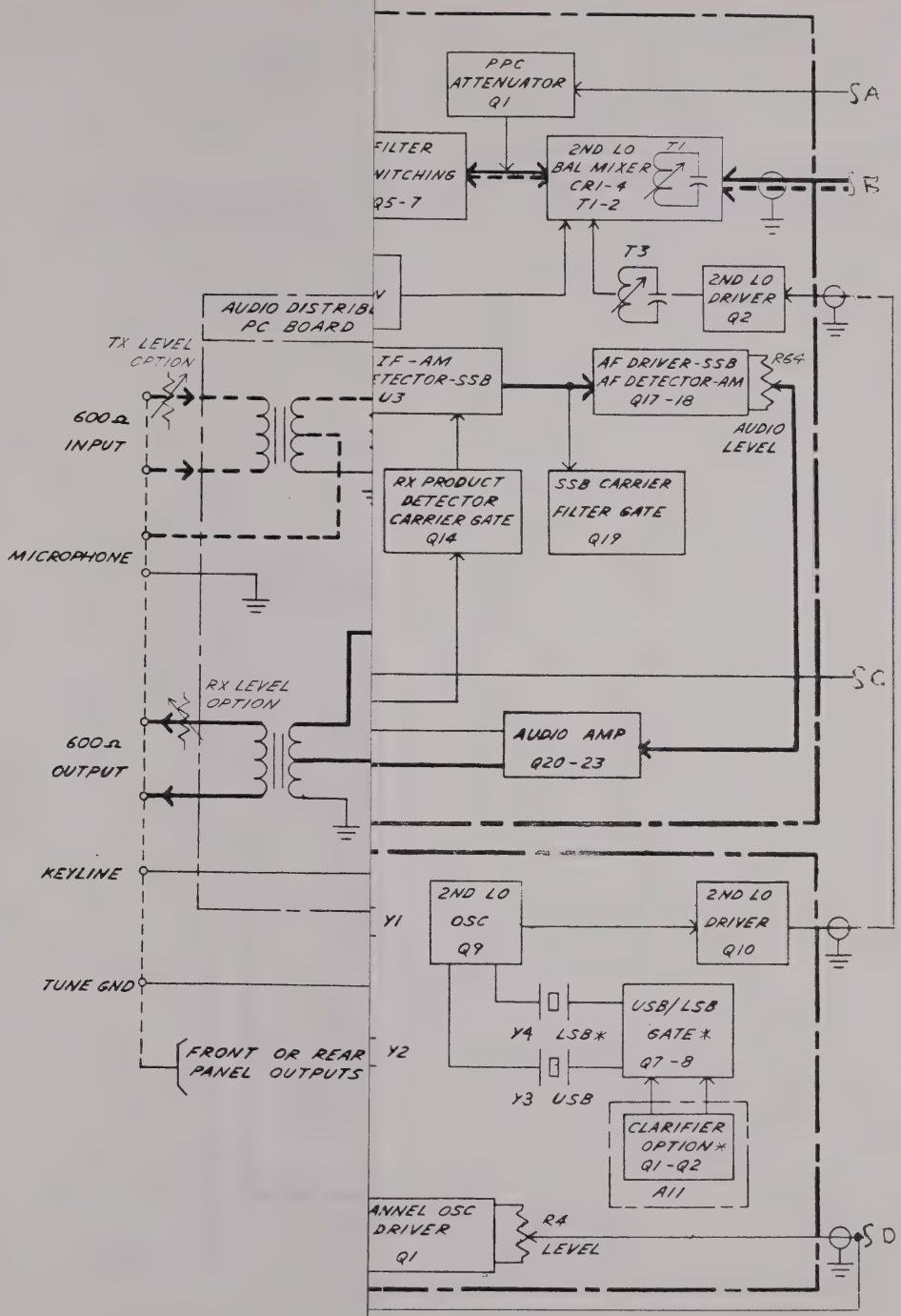
6.5 REMOTE OPTIONS.

A number of remote options are available. Installation and interconnections are cov-

ered in the manual supplied with the remote equipment. The remotes available are listed in paragraph 1.2 of this manual. Figure 6-6 is a simplified schematic of the remote interface.

The only remote option incorporated as part of this manual is the local portion of the remote which allows for channel selection. It consists of motor B1, relay K2, and switch assembly S6 and S7 (refer to schematic 6-5 and figure 6-7 if your set is so equipped).

The assembly attaches to the rear of the Transceiver from the inside and couples to the channel switch shaft of the matching network through a unidirectional coupling. With the remote motor attached, clockwise rotation only is possible. The wafer switches associated with the motor control the antenna coupler position and the motor position as determined by the remote control. Alignment of the wafers is necessary for proper transceiver and coupler tracking. Refer to paragraph 5.4.3 for switch alignment procedure.



6-1. Transceiver Block Diagram (Sheet 1 of 2)

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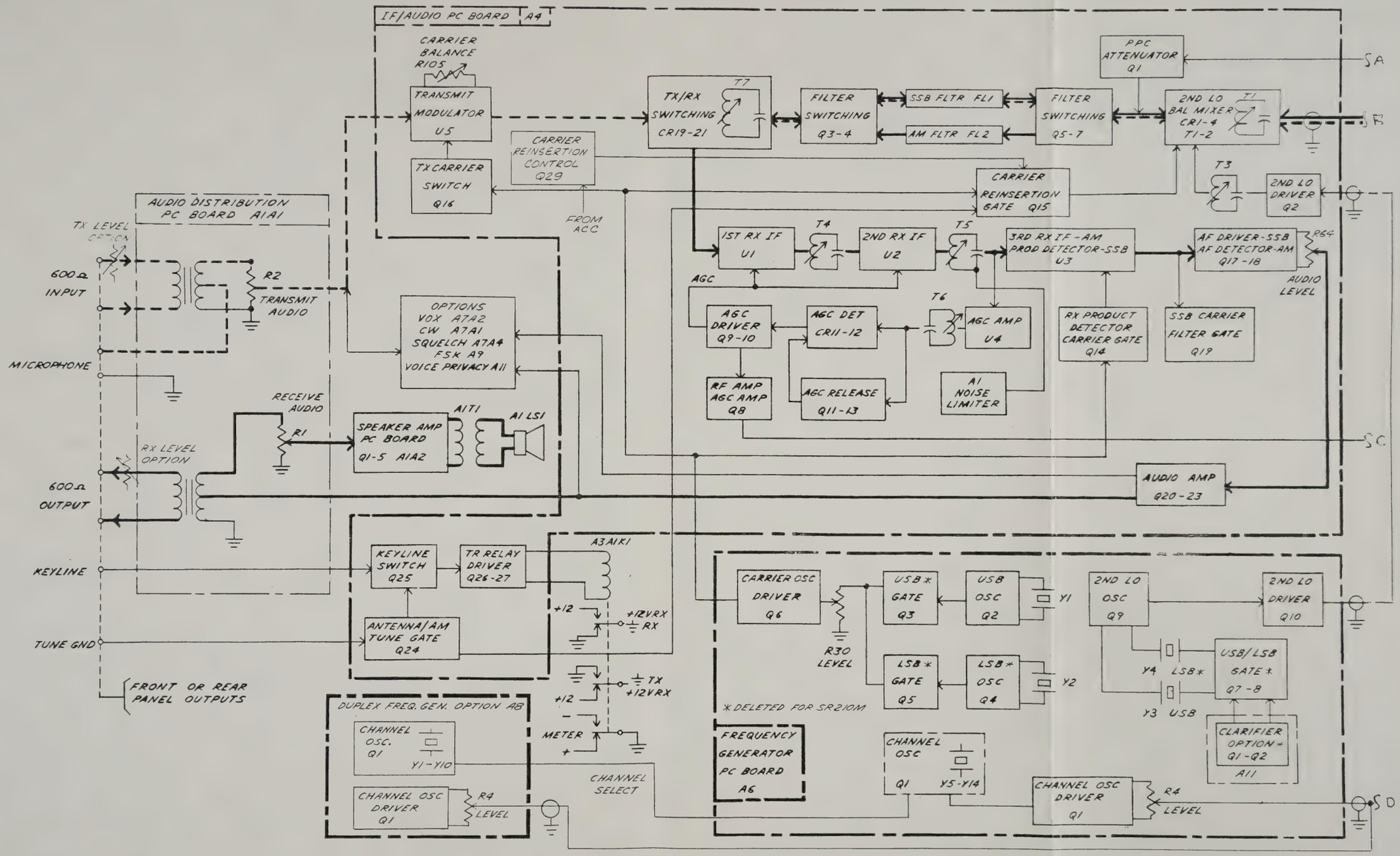


Figure 6-1. Transceiver Block Diagram (Sheet 1 of 2)

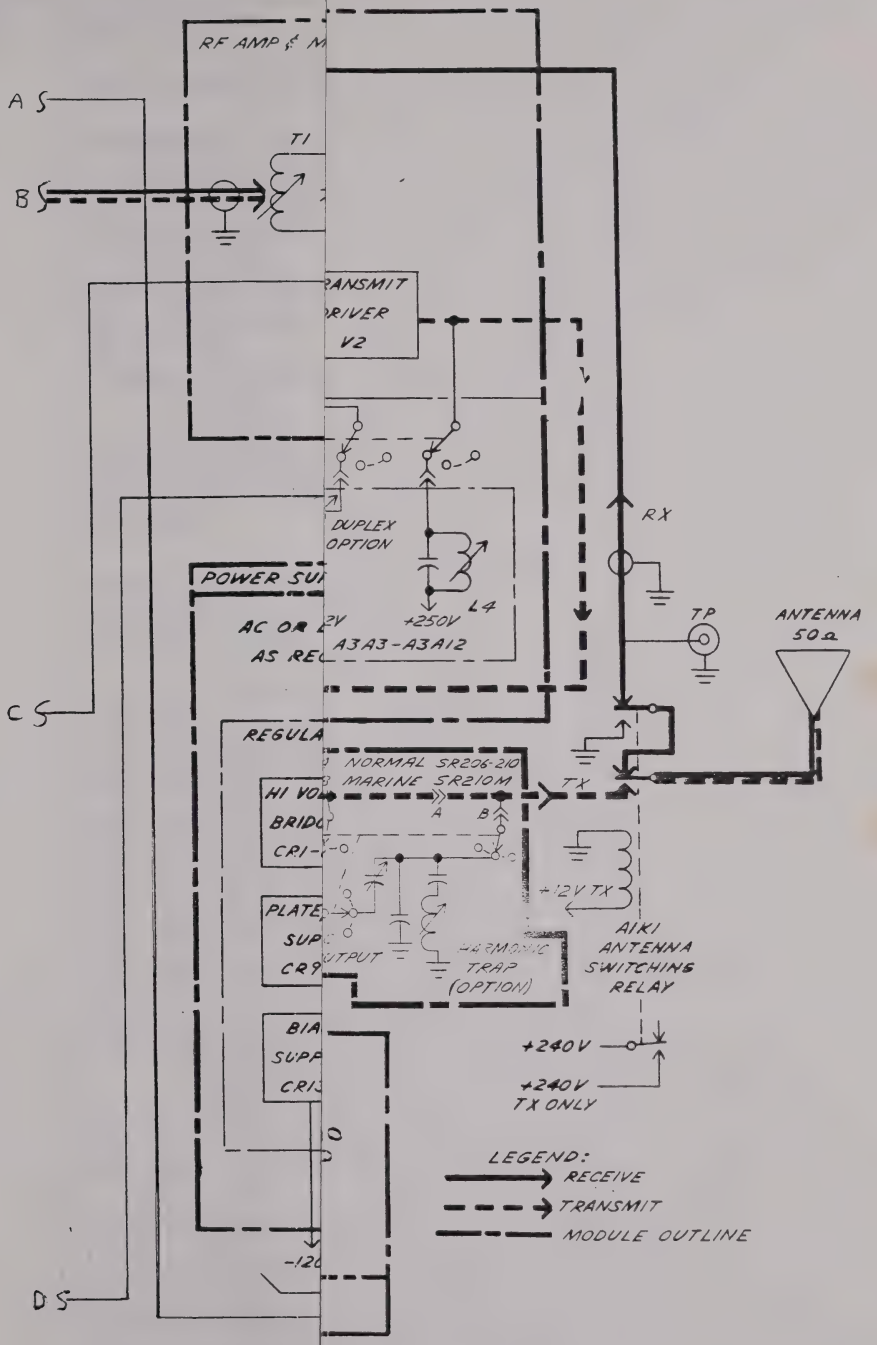


Figure 6-1. Transceiver
Block Diagram (Sheet 2 of 2)

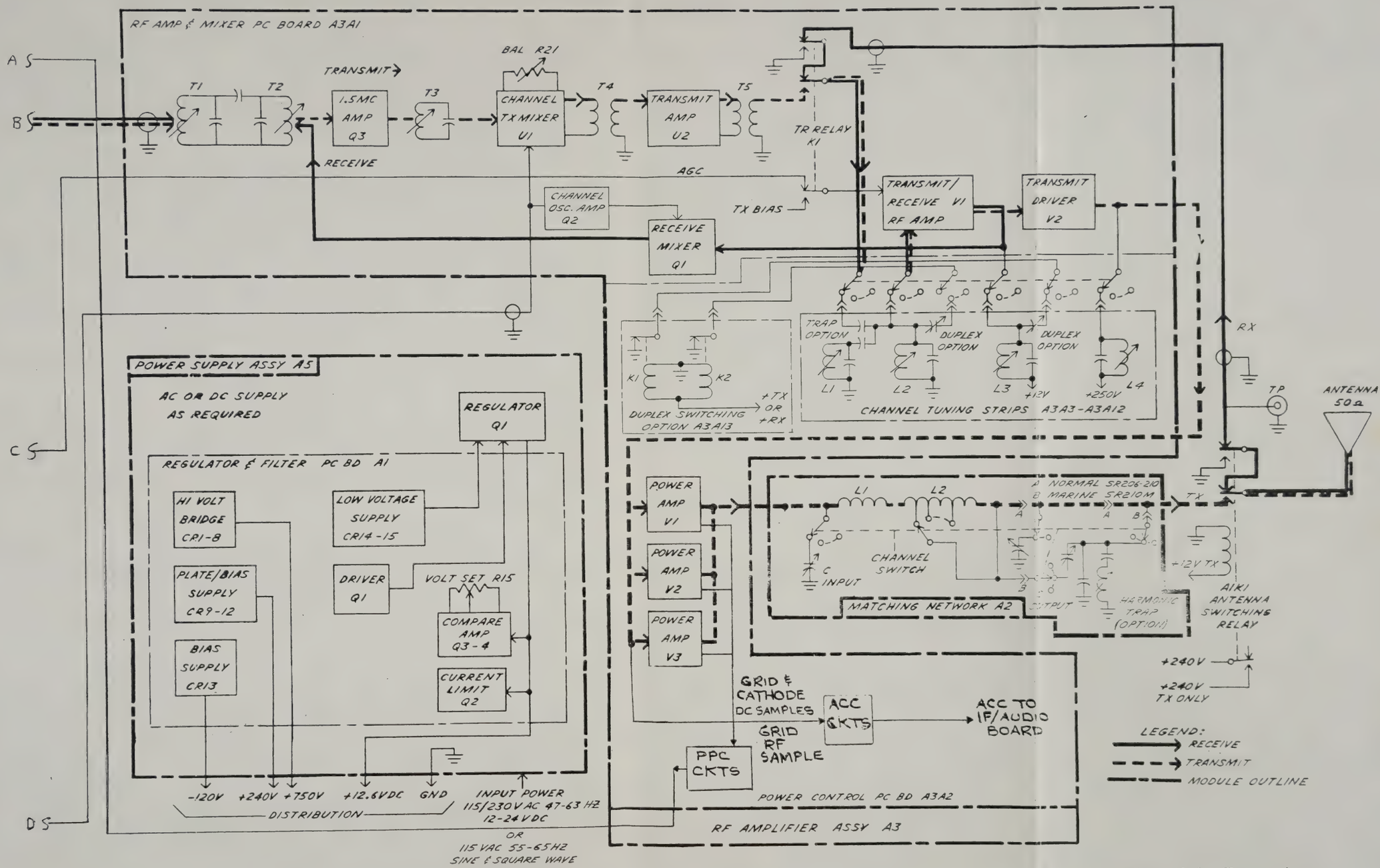


Figure 6-1. Transceiver Block Diagram (Sheet 2 of 2)

MAIN FRAME

REF DESIG	DESCRIPTION	P/N
---	MAIN FRAME ASSEMBLY	200100
A1A1	Programmed Audio Distribution PC Board	210080
A1A2	Audio Output PC Board	200090
A2	Matching Network Module 206/210	200200
A3	RF Amplifier Module 206/210	200300
A4	IF/Audio Module	200800
A5	Power Supply Module AC 115/230	200400
	OR AC sine/square	210400
	OR DC 12/24	200450
A6	Frequency Generator Module	
	6 Channel	200506
	10 Channel	200510
A7	Option Module (Squelch, VOX, CW)	200600
A9	FSK Keyer/Converter Module	200710
A10	(Not used)	---
B1	Motor, 24 Vac (Remote Only)	B00003
B1	Motor, DC (Remote Only)	B00004
B2	Fan (when supplied)	B00002
C1	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C2	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C3	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C4	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C5	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C6	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C7	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C8	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C9	Cap, mica, 22pF, 5%, 500 Vdcw	C05220
C10	Cap, mica, 91pF, 5%, 500 Vdcw	C05910
C11	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C12-C21	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C22	Cap, elect, 500μF, 50 Vdcw (used only in dc radios)	C70003
C23	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C24	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C25	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
CR1	Diode, si, signal, 1N4148	CR4148
CR2	Diode, si, 1 Amp, 200V, 1N4003	CR4003
CR3	Diode, si, signal, 1N4148	CR4148
CR4	Diode, si, signal, 1N4148	CR4148
CR5	Diode, si, 1 Amp, 200V, 1N4003	CR4003
CR6	Diode, si, signal, 1N4148	CR4148

MAIN FRAME (CONT.)

REF DESIG	DESCRIPTION	P/N
F1	For 115 Vac or 12 Vdc or 24 Vdc:	
	Fuse, 3AG, slo-blo, 5 Amp	F20500
	For 23 Vac: Fuse, 3AG, slo-blo, 2.5 Amp	F20250
HS1	Microphone, carbon	MK1001
	OR Microphone, dynamic	MK1004
J1	Recept, mic, 6 pin	J00201
J2	Recept, UHF/N (UG-680/U)	J00300
		210023
J3	Recept, phono, bulkhead mtg	J00100
J4	Recept, 4 pin	J00200
J5	Connector, 36 pin female	J00253
	OR Recept, 35 pin, MS-3102A-28-15S	J00255
J6	Connector, 36 pin male	P00253
	OR Recept, 17 pin, MS-3102A-20-29S	J00254
J7	Socket, octal type, 12 pins	X00700
	OR Recept, 10 pin, MS-3102A-18-1S	J00256
J8	Not used	---
J9	Recept, phono, staked mtg	J00101
J10	Recept, phono, staked mtg	J00101
K1	Relay, 3pdt, 12 Vdc	K10008
K2	Relay, 3pdt, 12 Vdc (remote only)	K10010
L1	Choke, rf, 1 mH	L11102
L2	Choke, rf, 1 mH	L11102
L3	Choke, rf, 100μH	L10101
M1	Meter, panel	M10001
MP1	Knob, channel select	MP0400
	OR	210029-3
MP2	Knob, Mode, Function, Speaker, Phone Patch, Remote, Audio	MP0401
	OR	210029-2
MP3	Knob, Option	MP0402
	OR	210029-1
MP4	Lens, Red	MP0212
MP5	Lens, Green	MP0213
MP6	Terminals, Crimp	H00340
MP7	Alignment Tool	MP0502
MP8	Contact Removal Tool	MP0504
MP9	Front Panel Hole Plug	MP0362
MP10	RF Amplifier Front Panel Coupling	200113

MAIN FRAME (CONT.)

REF DESIG	DESCRIPTION	P/N
P1	Plug, pc board, 15 pin	200004
P2	Connector, pc, 15 pin	X00802
P3	Lug, female, quick-disconnect	P00155
P4	Plug, 4 pin	P00200
P5	Plug, phono	P00101
P6	Plug, 6 pin	P00205
P7	Plug, mic, 6 pin, mates with J1	P00201
P8	Plug, UHF, PL-259, mates with J2	P00300
	OR N (UG-21 F/U)	P00401
P9	Plug, 36 pin, mates with J5	P00253
	OR Plug, 35 pin (MS-3106B-28-15P)	P00255
P10	Plug, 36 pin, mates with J6	J00253
	OR Plug, 17 pin (MS-3106B-20-29P)	P00254
P11	Plug, 12 pin, mates with J7 (options)	P00205
	OR Plug, 10 pin (MS-3106B-18-1P)	P00256
P12	Not used	---
P13	Plug, 4 pin, mates with J4 (Fan)	P00200
Q1	Triac, A01061	Q00003
R1	Pot, panel mt, 5K, 1/2W, linear, w/sw	R87502
R2	Pot, panel mt, 5K, 1/2W, linear	R85502
R3	Pot, panel mt, 5K, 1/2W, linear, w/sw	R87502
R4	Pot, panel mt, 5K, 1/2W, linear, w/sw	R87502
R5	Pot, panel mt, 5K, 1/2W, linear	R85502
R6	Pot, panel mt, 5K, 1/2W, linear	R85502
R7	Pot, panel mt, 5K, 1/2W, linear, w/sw	R87502
R8	Pot, panel mt, 5K, 1/2W, linear	R85502
R9	Res, var, 2.5K, 1/2W	210027
R10	Res, var, 2.5K, 1/2W	210027
R11	Res, comp, 100K, 5%, 1/4W	R20104
R12	Res, comp, 100Ω, 5%, 1/4W	R20101
S1	Switch, rotary, 2 deck, 2 pos (Remote/Local)	S10006
S2	Switch, rotary, 2 deck, 4 pos (Function)	S10003
S3	Switch, rotary, 1 deck, 12 pos (Phone Patch)	S10004
S4	Not used	---
S5	Not used	---
S6	Switch wafer, 10 pos, open-seeking (Motor Control)	S10205
S7	Switch wafer, 1 pole, 11 pos, shorting (Coupler/ PA Channel Command)	S10201
S8	Not used	---
S9	Not used	---
S10	Switch, toggle, min, spdt	S00312
S11	Switch, rotary, 1 deck, 5 pos, MODE	S10002

MAIN FRAME (CONT.)

REF DESIG	DESCRIPTION	P/N
XA4	Connectors, pc, 22 pin (two each)	X00801
XA5	Not used	---
XA6	Connectors, pc, 22 pin (two each)	X00801
XA7	Connectors, pc, 22 pin	X00801
XA8	Connectors, pc, 22 pin (two each)	X00801
XA9	Connectors, pc, 15 pin (two each)	X00800
XA10	Not used	---
XA11	Connectors, pc, 15 pin (two each)	X00800

AUDIO DIST PC BD ASSY A1A1

REF DESIG	DESCRIPTION	P/N
---	AUDIO DISTRIBUTION PC BOARD ASSEMBLY	210080
C1	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C2	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C3	Not used	---
C4	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C5	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C6	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
CR1	Diode, si, signal, 1N4148	CR4148
CR2	Diode, si, signal, 1N4148	CR4148
CR3	Diode, si, signal, 1N4148	CR4148
CR4	Diode, si, signal, 1N4148	CR4148
CR5	Diode, si, signal, 1N4148	CR4148
CR6	Diode, si, signal, 1N4148	CR4148
CR7	Diode, si, signal, 1N4148	CR4148
CR8	Diode, si, signal, 1N4148	CR4148
CR9	Diode, si, signal, 1N4148	CR4148
CR10	Diode, si, signal, 1N4148	CR4148
CR11	Diode, si, signal, 1N4148	CR4148
CR12	Diode, si, signal, 1N4148	CR4148
CR13	Diode, si, signal, 1N4148	CR4148
CR14	Diode, si, signal, 1N4148	CR4148
CR15	Diode, si, signal, 1N4148	CR4148
CR16	Diode, si, signal, 1N4148	CR4148
CR17	Diode, si, signal, 1N4148	CR4148
CR18	Diode, si, signal, 1N4148	CR4148
CR19	Diode, si, signal, 1N4148	CR4148
CR20	Diode, si, signal, 1N4148	CR4148
CR21	Diode, si, signal, 1N4148	CR4148
CR22	Diode, si, signal, 1N4148	CR4148
CR23	Diode, si, signal, 1N4148	CR4148
CR24	Diode, si, signal, 1N4148	CR4148
CR25	Diode, si, signal, 1N4148	CR4148
CR26	Diode, si, signal, 1N4148	CR4148
CR27	Diode, si, signal, 1N4148	CR4148
CR28	Diode, si, signal, 1N4148	CR4148
CR29	Diode, si, signal, 1N4148	CR4148
CR30	Diode, si, signal, 1N4148	CR4148
CR31	Diode, si, signal, 1N4148	CR4148
CR32	Diode, si, signal, 1N4148	CR4148
CR33	Diode, si, signal, 1N4148	CR4148
CR34	Diode, si, signal, 1N4148	CR4148
CR35	Diode, si, signal, 1N4148	CR4148
CR36	Diode, si, signal, 1N4148	CR4148
CR37	Diode, si, signal, 1N4148	CR4148
CR38	Diode, si, signal, 1N4148	CR4148

AUDIO DIST PC BD ASSY A1A1 (CONT.)

REF DESIG	DESCRIPTION	P/N
CR39	Diode, si, signal, 1N4148	CR4148
CR40	Diode, si, signal, 1N4148	CR4148
DS1	Lamp, 14V, 80 mA, No. 756	DS1001
DS2	Lamp, 14V, 80 mA, No. 756	DS1001
MP1	Lampholder, T-3 1/4	X00500
MP2	Lampholder, T-3 1/4	X00500
MP3	Lamp shield	MP0208
MP4	Lamp shield	MP0208
Q1	Transistor, npn, 2N4400	Q44000
Q2	Transistor, npn, 2N4123	Q41230
Q3	Transistor, npn, 2N4400	Q44000
Q4	Transistor, pnp, 2N4125	Q41250
R1	Pot, panel mt, 1K, log taper	R80102
R2	Pot, panel mt, 1K, log taper	R80102
R3	Res, comp, 150Ω, 5%, 1/4W	R20151
R4	Res, comp, 4.7K, 5%, 1/4W	R20472
R5	Res, comp, 560Ω, 5%, 1/2W	R30561
R6	Res, comp, 2.2K, 5%, 1/4W	R20222
R7	Res, comp, 10K, 5%, 1/4W	R20103
R8	Res, comp, 2.2K, 5%, 1/4W	R20222
R9	Res, comp, 10K, 5%, 1/4W	R20103
R10	Res, comp, 10K, 5%, 1/4W	R20103
R11	Res, comp, 6.8K, 5%, 1/4W	R20682
R12	Res, comp, 100Ω, 5%, 1/4W	R20101
R13	Res, comp, 4.7K, 5%, 1/4W	R20472
R14	Res, comp, 4.7K, 5%, 1/4W	R20472
R15	Res, comp, 39K, 5%, 1/4W	R20393
S1	Switch, rotary, 12 pos, shorting	S10009
T1	Transformer, audio, 600Ω:600Ω	T10350
T2	Transformer, audio, 600Ω:600Ω	T10350

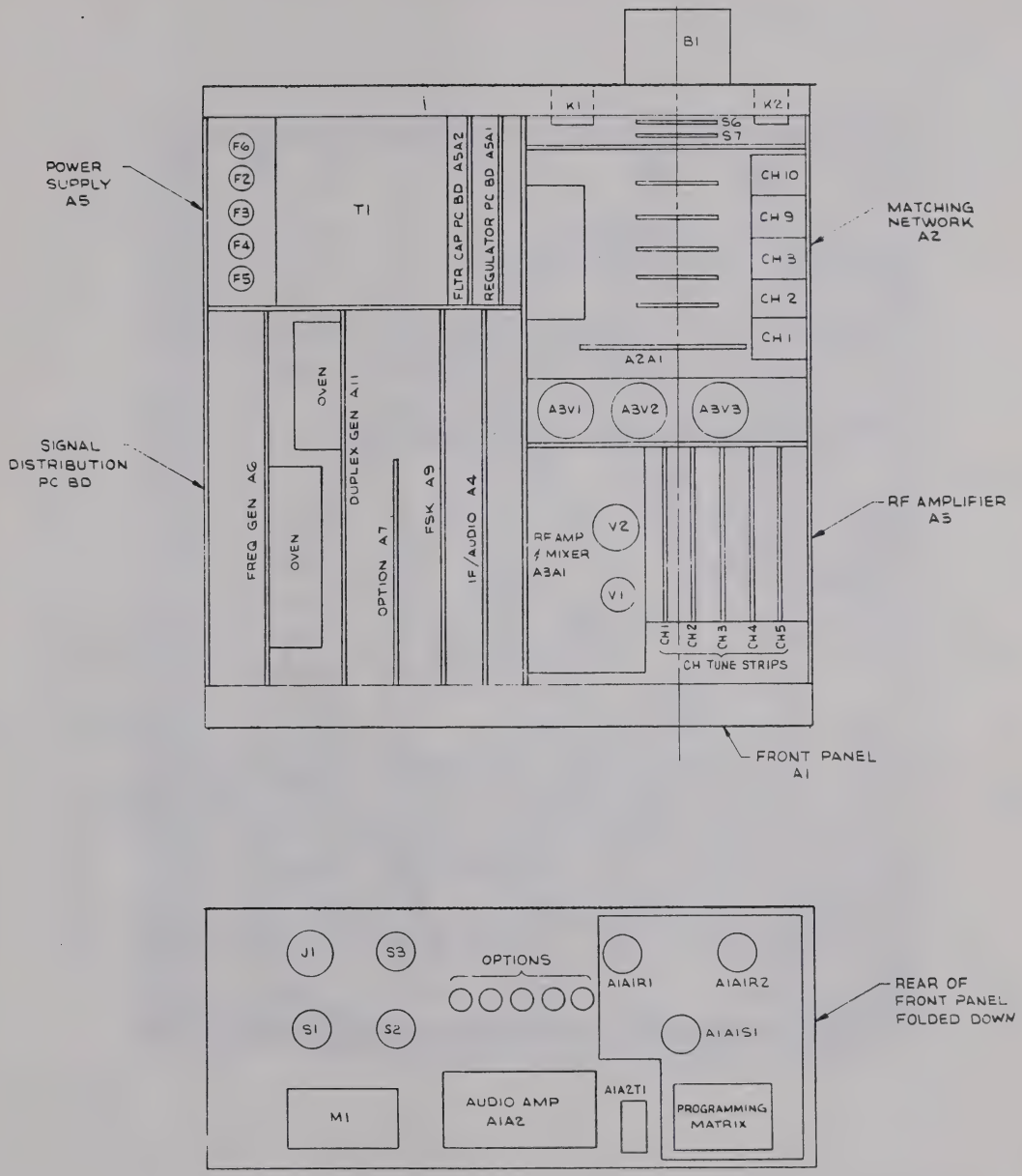


Figure 6-2. Major Assembly Locations

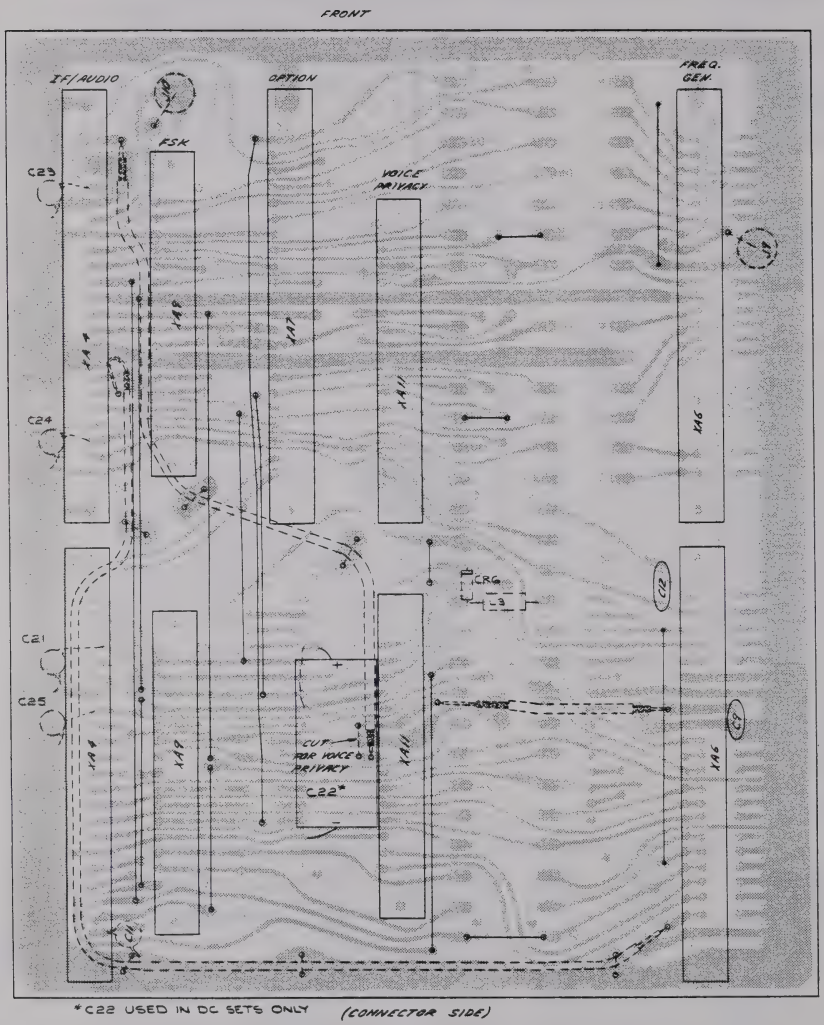


Figure 6-3. Signal Distribution Motherboard

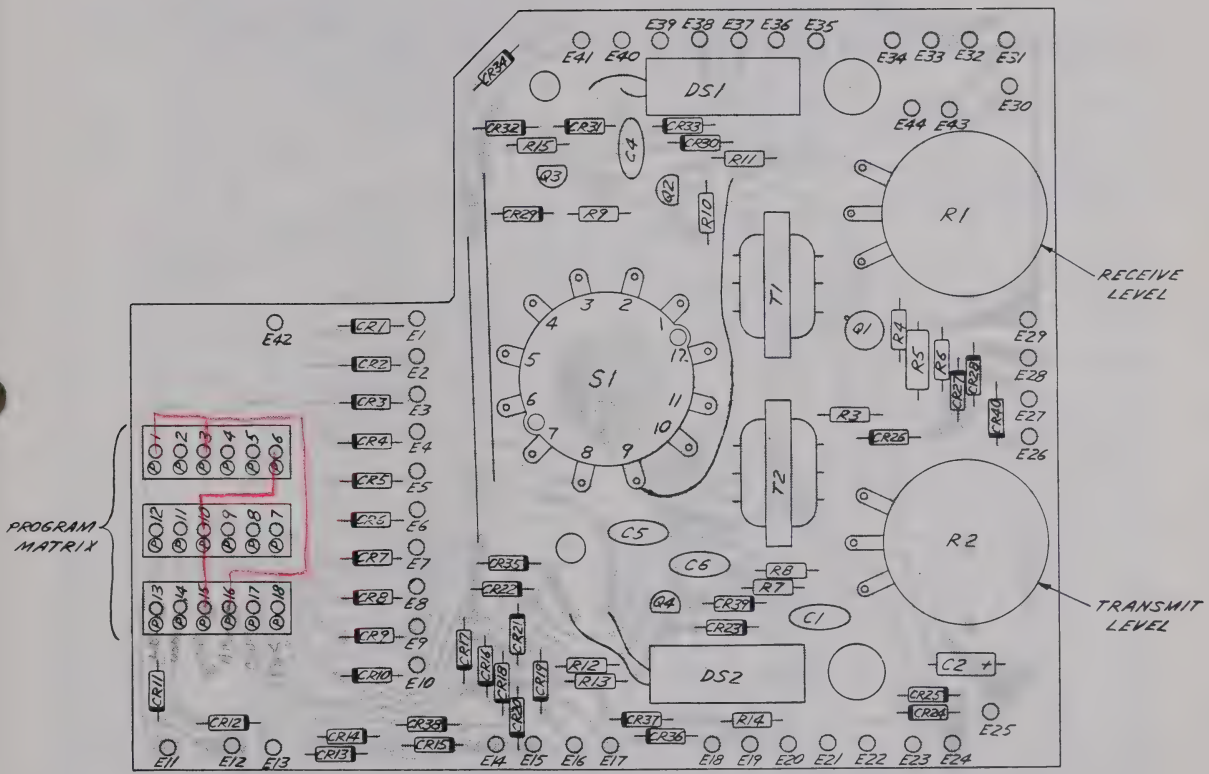


Figure 6-4. Audio Distribution PC Board Assembly A1A1

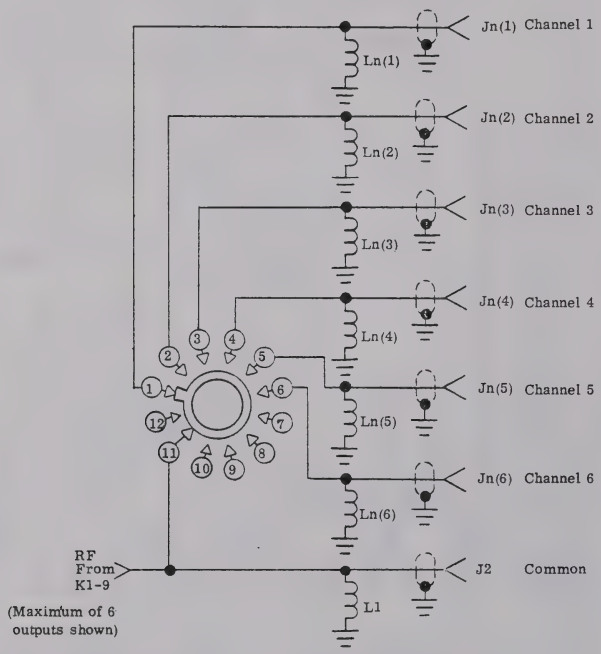
AR-270 MULTIPLE OUTPUT OPTION

The AR-270 Multiple Output Option consists of one extra switch wafer and from 2 to 6 extra rf antenna connectors mounted on the rear panel of the Transceiver. It may be used with non-remote controlled Transceivers only.

The extra switch wafer, which is located just inside the rear panel, is physically connected to the front panel CHANNEL switch; so operation of this switch is automatic.

J2, the normal antenna connector, is still common to all channels.

Following is a schematic and parts list for this option.



Switch, rotary	S10200	1
Connectors, UHF	J00300	1 per channel
Chokes, 1 mH	L11102	1 per channel

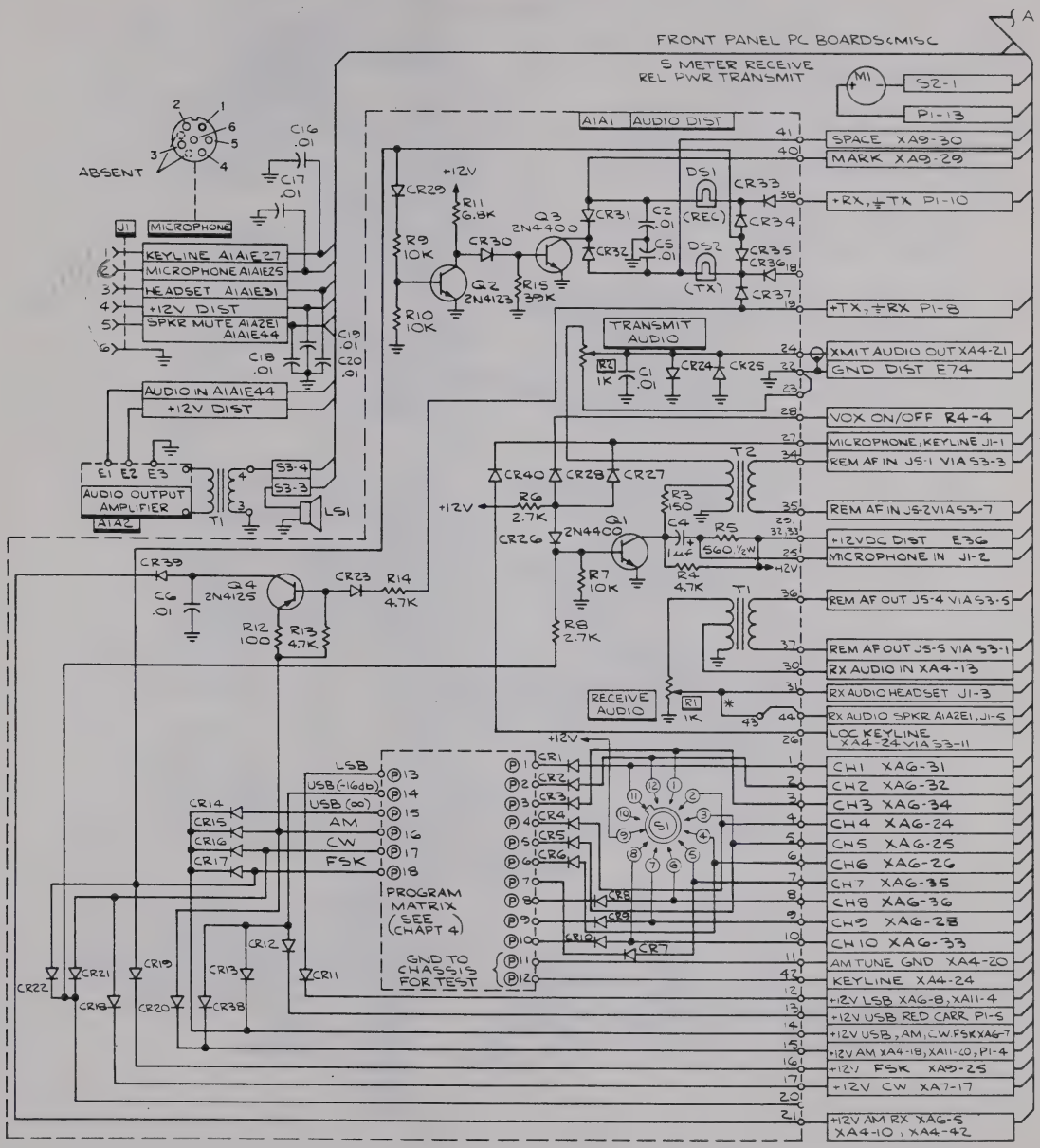


Figure 6-5. Main Frame Interconnection Diagram, Types SR-206/210, Type I FOR BASIC NON - REMOTE TRANSCEIVERS

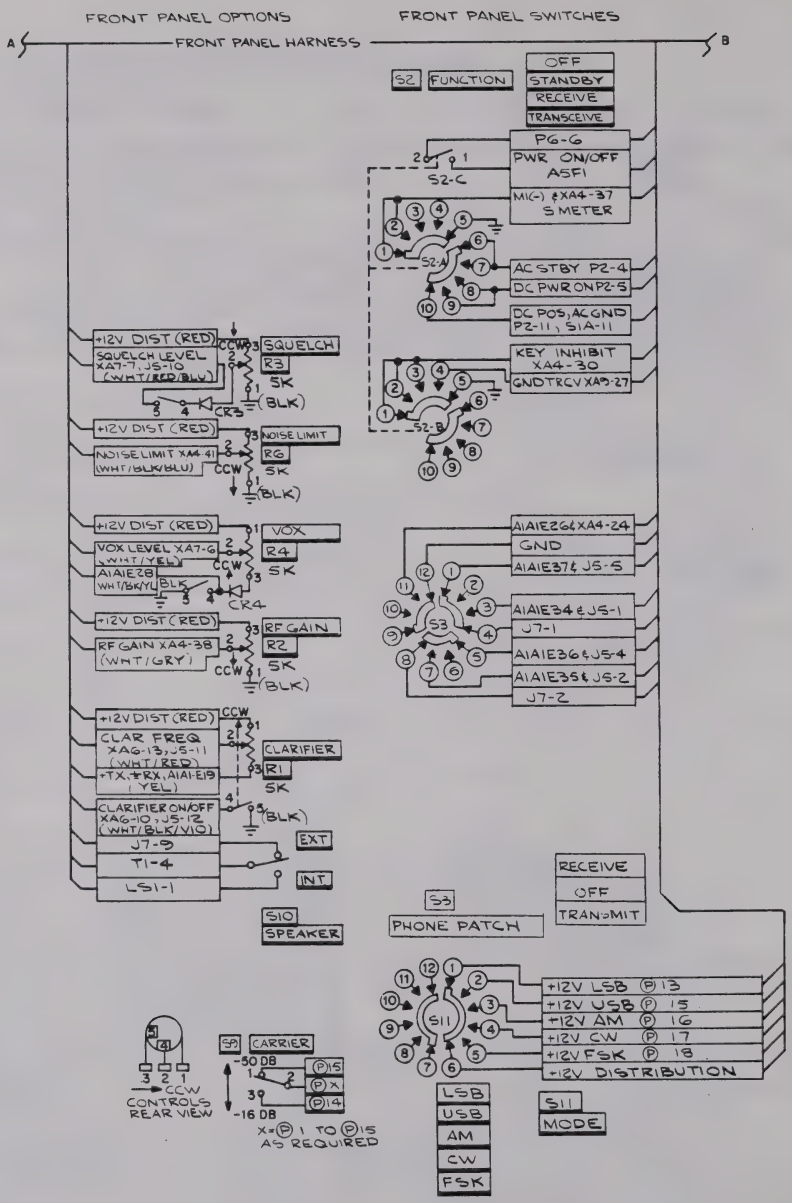


Figure 6-5. Main Frame Interconnection Diagram, SR-206/210, Type I
FOR BASIC NON - REMOTE TRANSCEIVERS

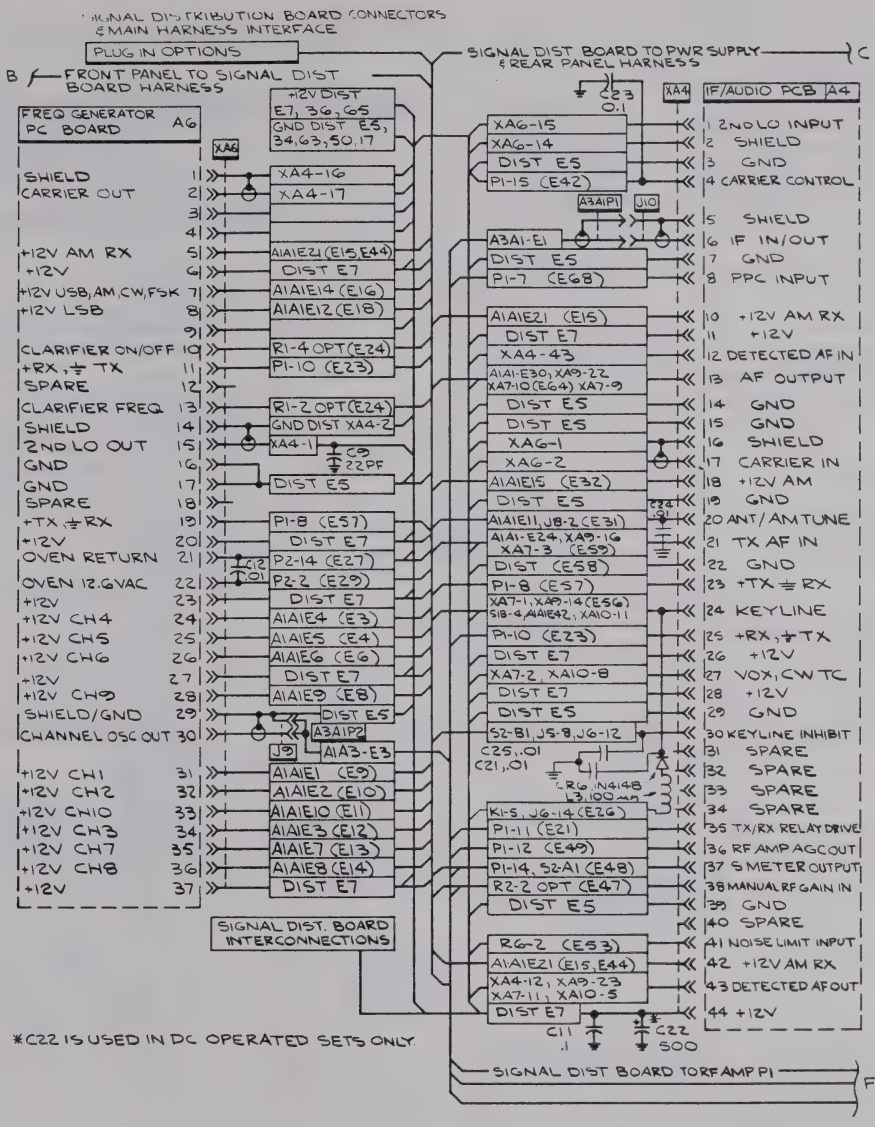


Figure 6-5. Main Frame Interconnection Diagram, SR-206/210, Type I
FOR BASIC NON - REMOTE TRANSCEIVERS

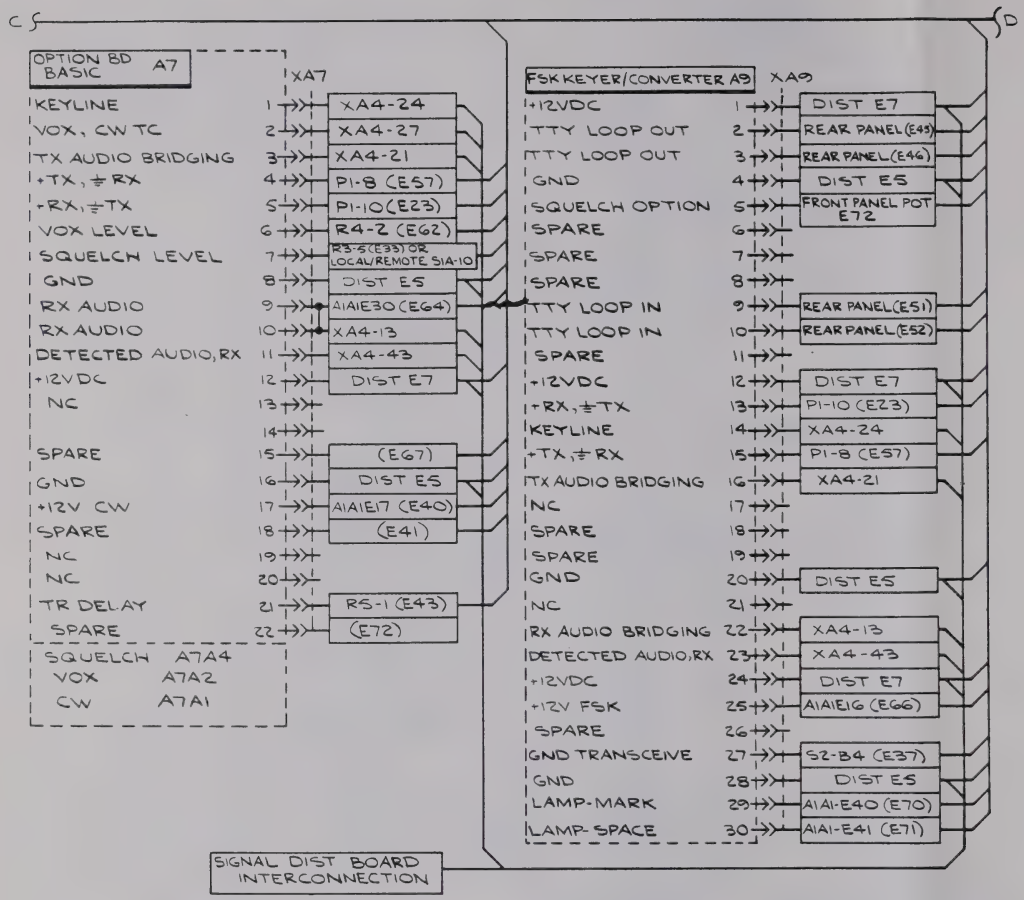


Figure 6-5. Main Frame Interconnection Diagram, SR-206/210, Type I
FOR BASIC NON - REMOTE TRANSCEIVERS

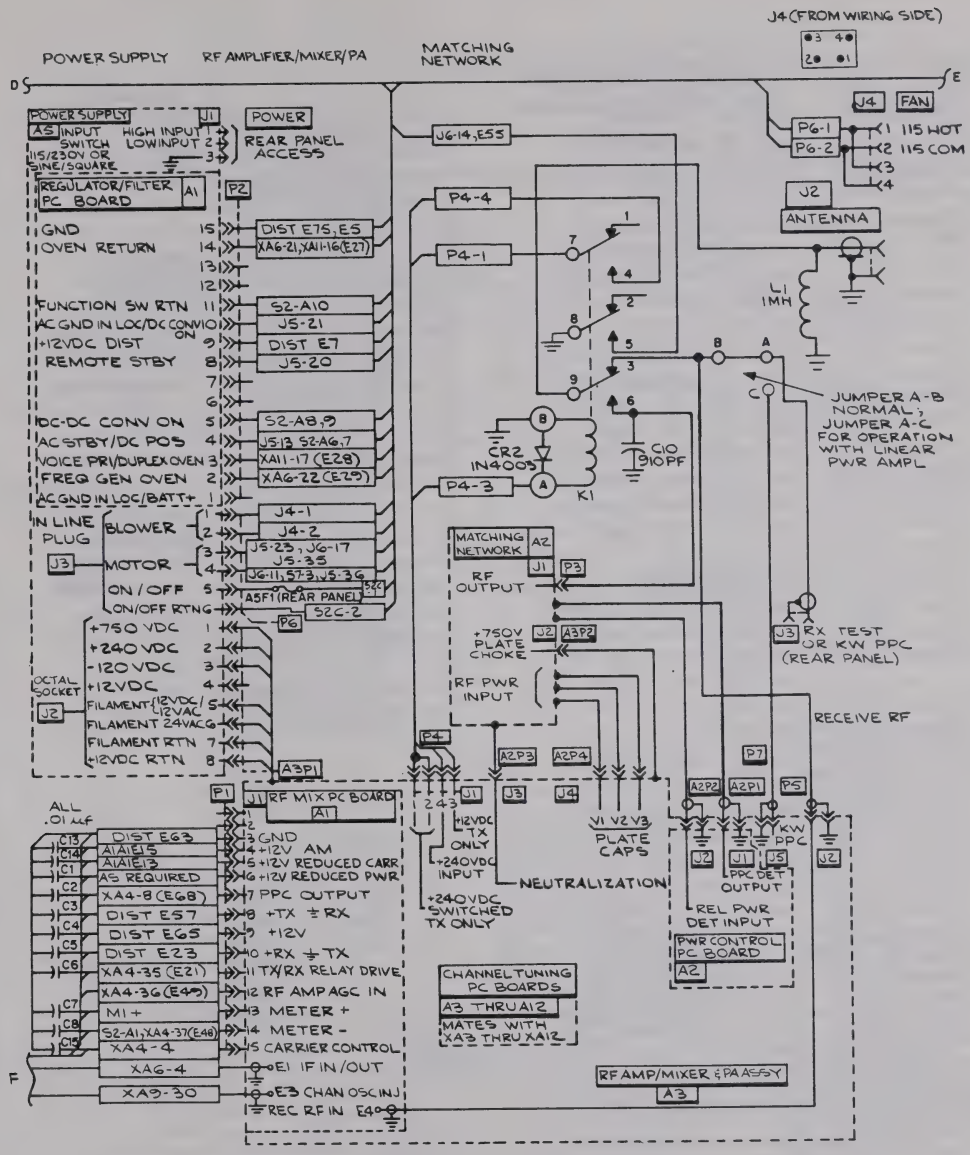


Figure 6-5. Main Frame Interconnection Diagram, SR-206/210, Type I
FOR BASIC NON - REMOTE TRANSCEIVERS

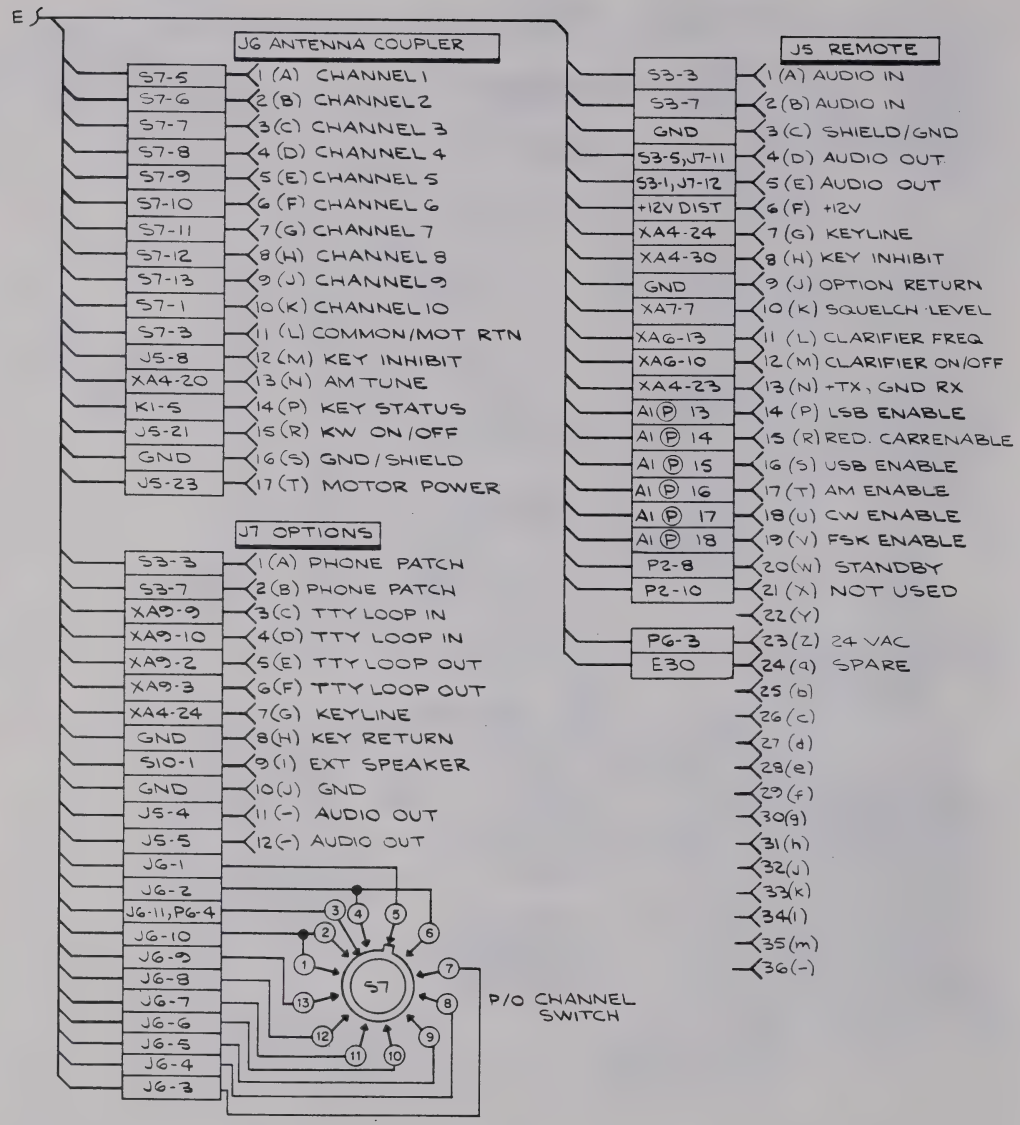
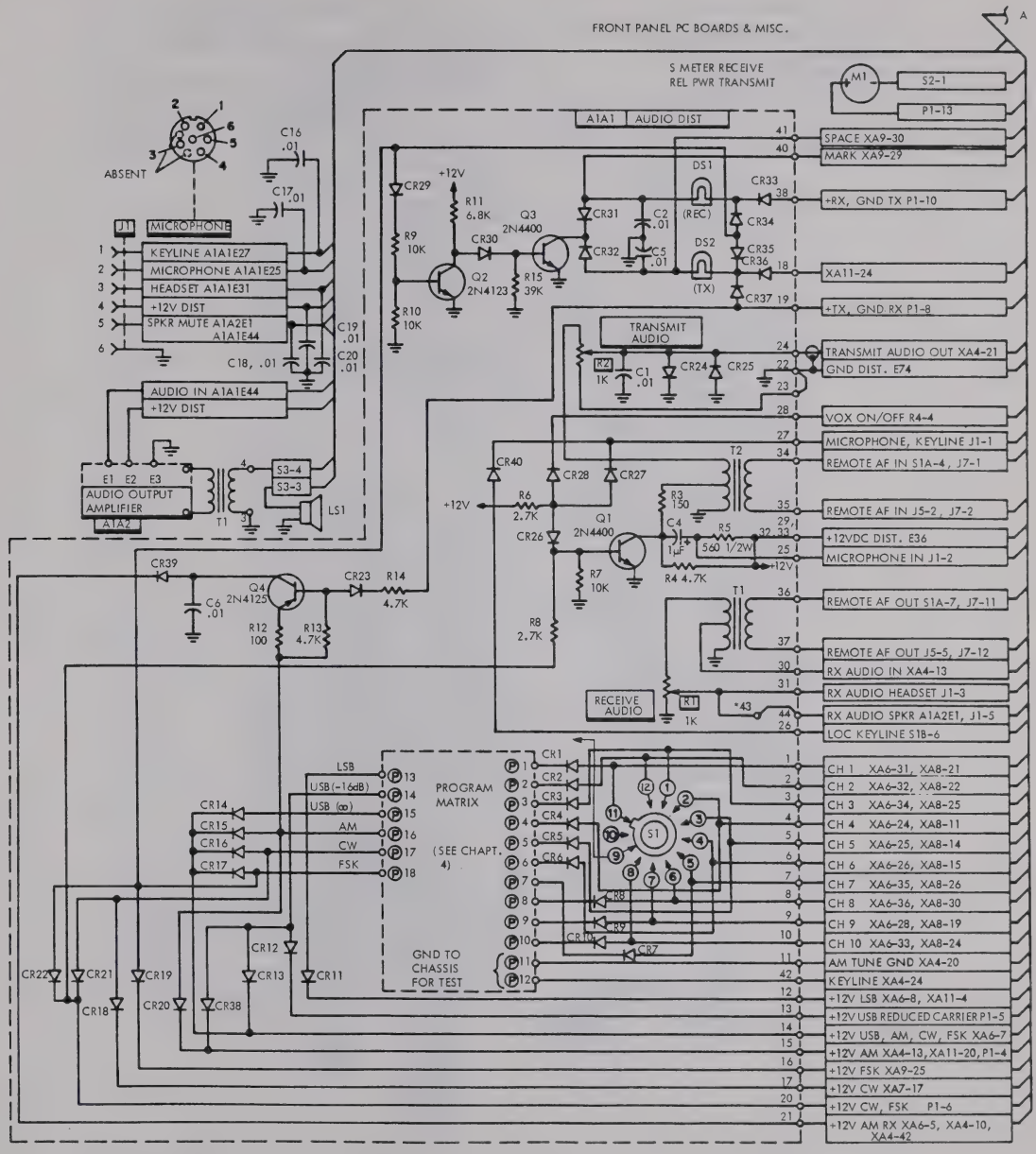


Figure 6-5: Main Frame Interconnection Diagram, SR-206/210, Type I
FOR BASIC NON - REMOTE TRANSCEIVERS



*REMOVE JUMPER FROM E43 & E44 FOR SPEAKER MUTING WITH DESKSET OPTION.

Figure 6-5A. Main Frame Interconnection Diagram, SR-206/210, Type II FOR REMOTE - CONTROLLED TRANSCEIVERS

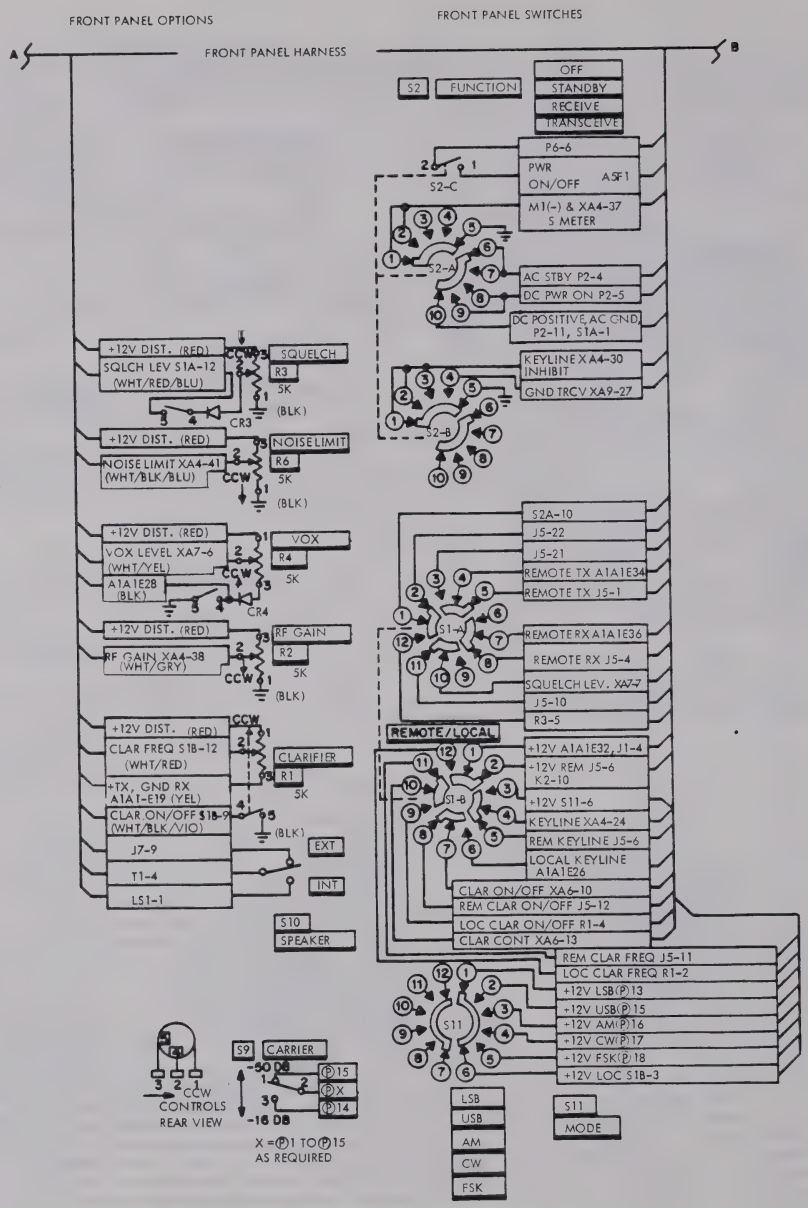


Figure 6-5A. Main Frame Interconnection Diagram, SR-206/210, Type II FOR REMOTE - CONTROLLED TRANSCEIVERS

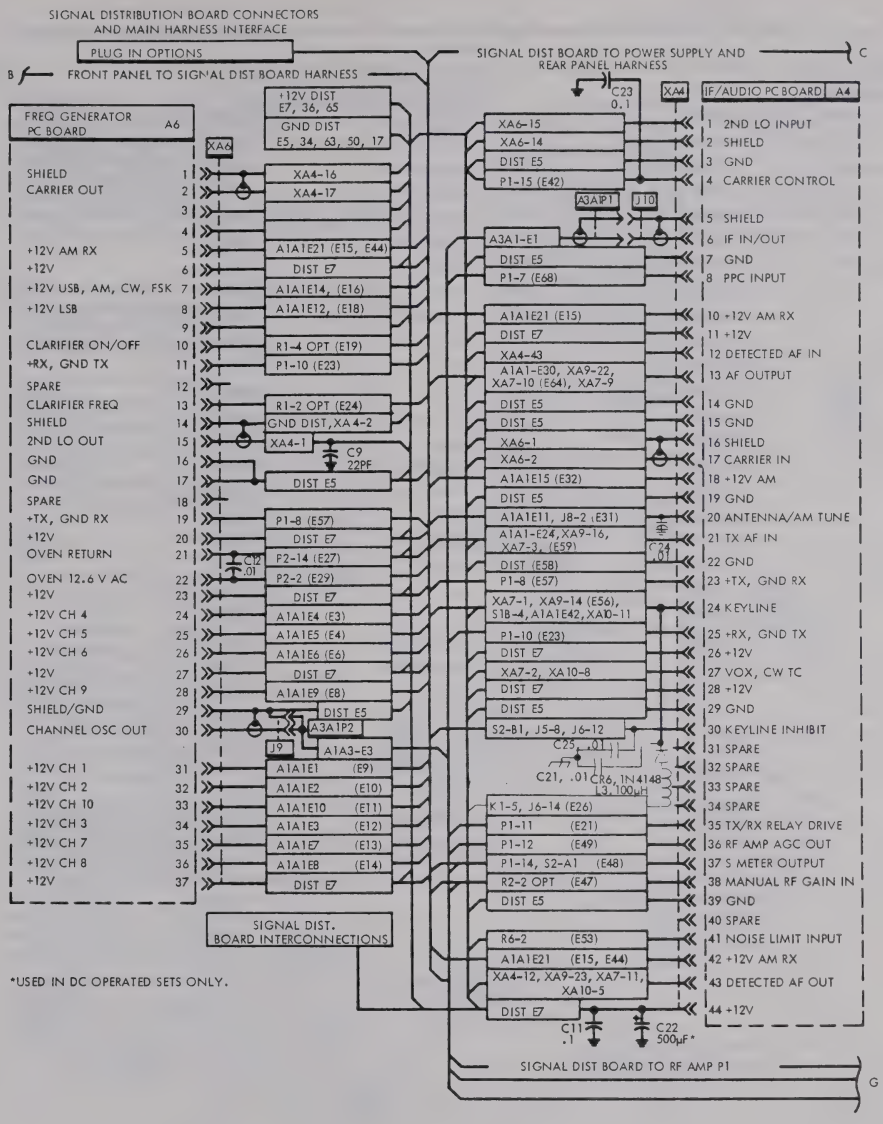


Figure 6-5A. Main Frame Interconnection Diagram, SR-206/210, Type II FOR REMOTE - CONTROLLED TRANSCEIVERS

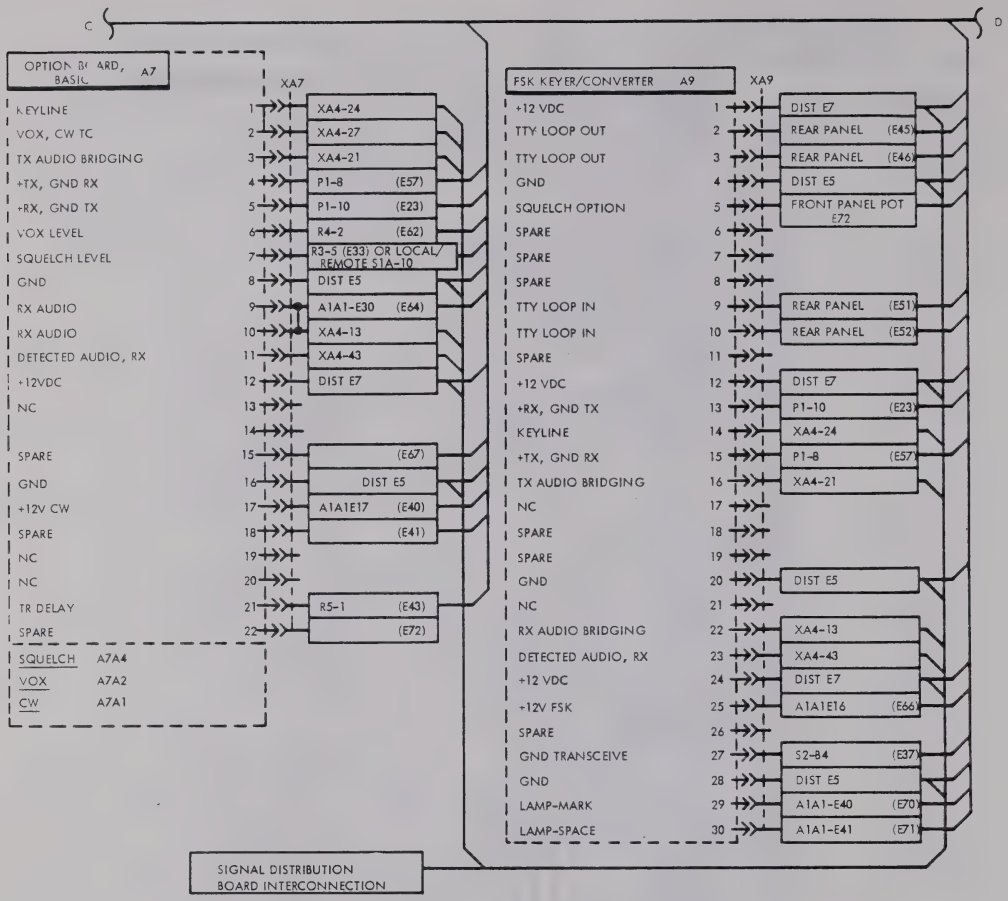


Figure 6-5A. Main Frame Interconnection Diagram, SR-206/210, Type II FOR REMOTE - CONTROLLED TRANSCEIVERS

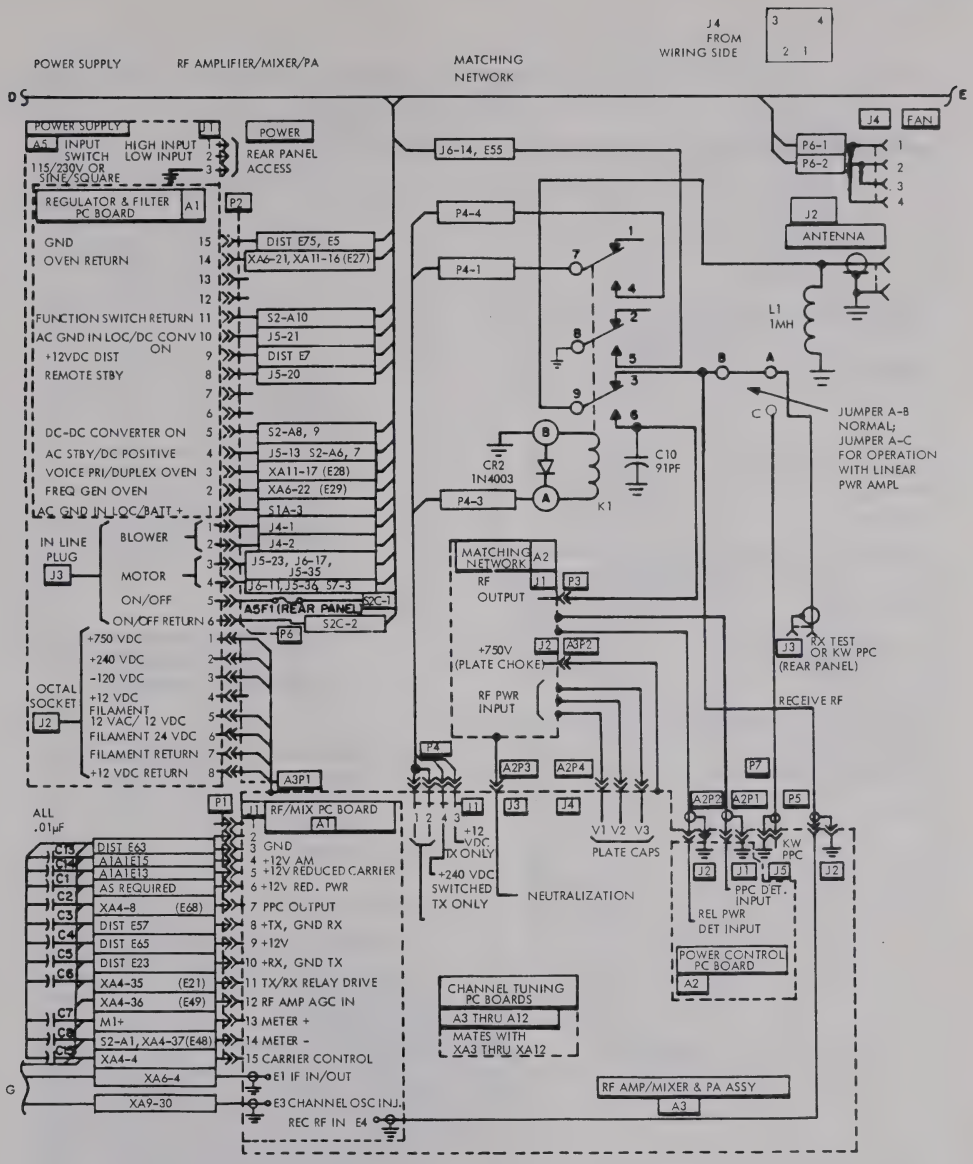


Figure 6-5A. Main Frame Interconnection Diagram, SR-206/210, Type II FOR REMOTE - CONTROLLED TRANSCEIVERS

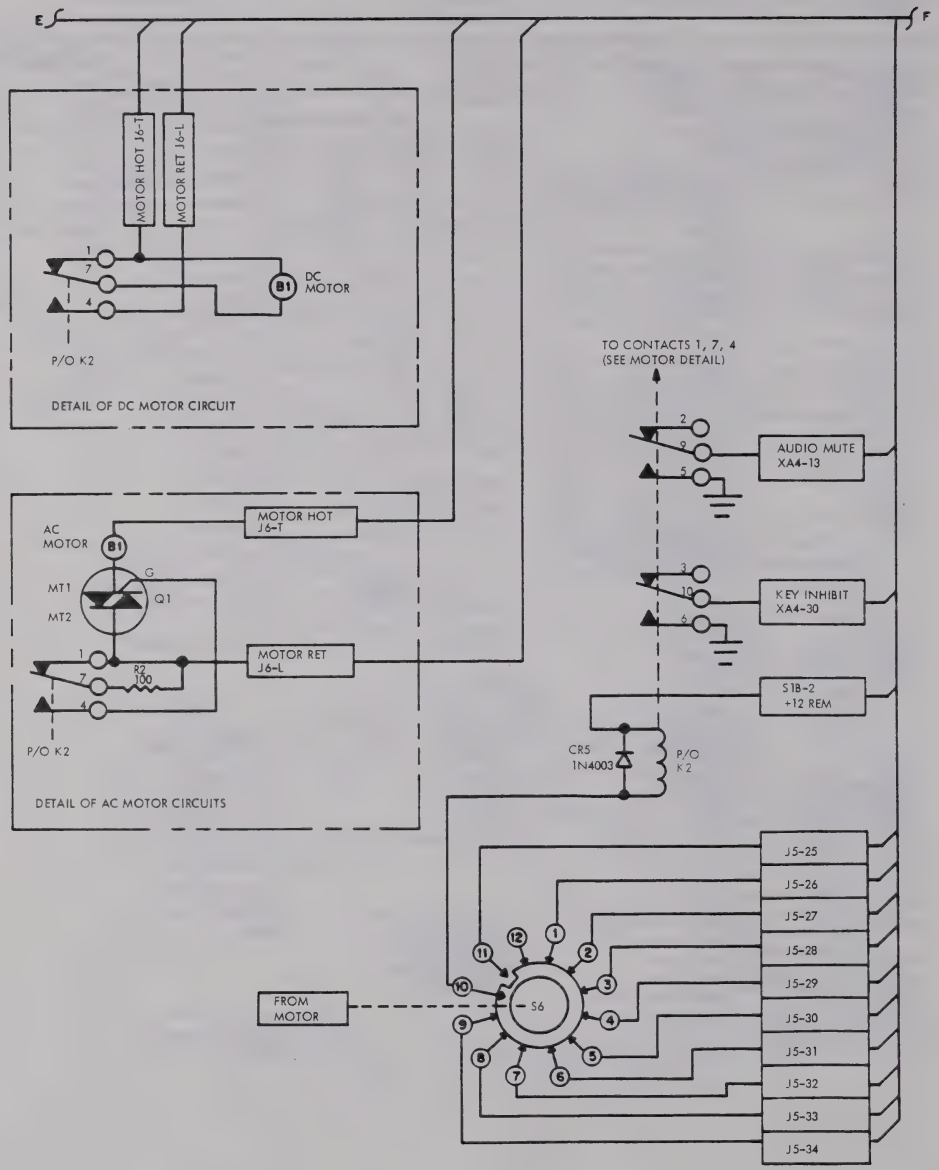


Figure 6-5A. Main Frame Interconnection Diagram, SR-206/210, Type II
FOR REMOTE - CONTROLLED TRANSCEIVERS

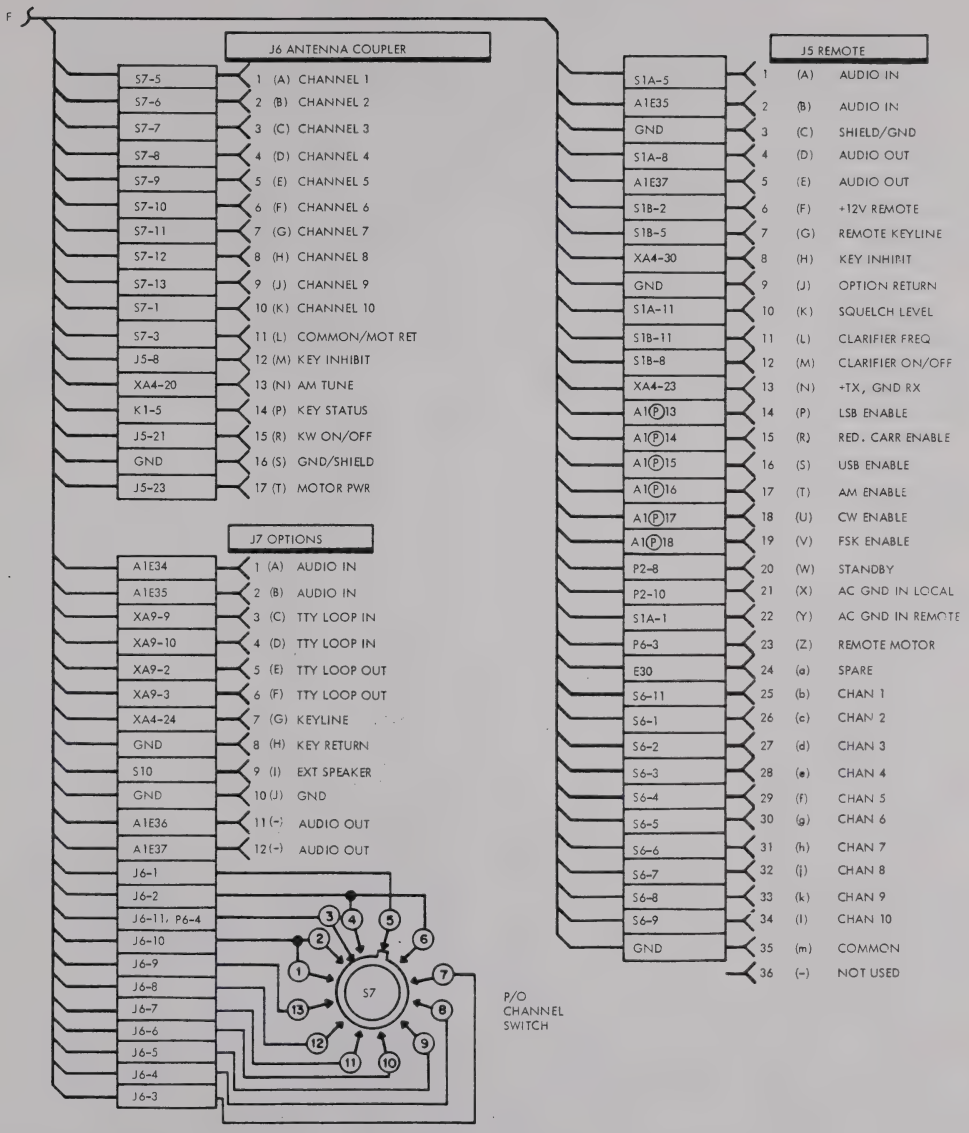

J6 ANTENNA COUPLER
S7-5 1 (A) CHANNEL 1
S7-6 2 (B) CHANNEL 2
S7-7 3 (C) CHANNEL 3
S7-8 4 (D) CHANNEL 4
S7-9 5 (E) CHANNEL 5
S7-10 6 (F) CHANNEL 6
S7-11 7 (G) CHANNEL 7
S7-12 8 (H) CHANNEL 8
S7-13 9 (J) CHANNEL 9
S7-1 10 (K) CHANNEL 10
S7-3 11 (L) COMMON/MOT RET
J5-8 12 (M) KEY INHIBIT
XA4-20 13 (N) AM TUNE
K1-5 14 (P) KEY STATUS
J5-21 15 (R) KW ON/OFF
GND 16 (S) GND/SHIELD
J5-23 17 (T) MOTOR PWR
J7 OPTIONS
A1E34 1 (A) AUDIO IN
A1E35 2 (B) AUDIO IN
XA9-9 3 (C) TTY LOOP IN
XA9-10 4 (D) TTY LOOP IN
XA9-2 5 (E) TTY LOOP OUT
XA9-3 6 (F) TTY LOOP OUT
XA4-24 7 (G) KEYLINE
GND 8 (H) KEY RETURN
S10 9 (I) EXT SPEAKER
GND 10 (J) GND
A1E36 11 (-) AUDIO OUT
A1E37 12 (-) AUDIO OUT
J6-1
J6-2
J6-11, P6-4
J6-10
J6-9
J6-8
J6-7
J6-6
J6-5
J6-4
J6-3
S7
P/O CHANNEL SWITCH
J5 REMOTE
S1A-5 1 (A) AUDIO IN
A1E35 2 (B) AUDIO IN
GND 3 (C) SHIELD/GND
S1A-8 4 (D) AUDIO OUT
A1E37 5 (E) AUDIO OUT
S1B-2 6 (F) +12V REMOTE
S1B-5 7 (G) REMOTE KEYLINE
XA4-30 8 (H) KEY INHIBIT
GND 9 (J) OPTION RETURN
S1A-11 10 (K) SQUELCH LEVEL
S1B-11 11 (L) CLARIFIER FREQ
S1B-8 12 (M) CLARIFIER ON/OFF
XA4-23 13 (N) +TX, GND RX
A1P13 14 (P) LSB ENABLE
A1P14 15 (R) RED. CARR ENABLE
A1P15 16 (S) USB ENABLE
A1P16 17 (T) AM ENABLE
A1P17 18 (U) CW ENABLE
A1P18 19 (V) FSK ENABLE
P2-8 20 (W) STANDBY
P2-10 21 (X) AC GND IN LOCAL
S1A-1 22 (Y) AC GND IN REMOTE
P6-3 23 (Z) REMOTE MOTOR
E30 24 (a) SPARE
S6-11 25 (b) CHAN 1
S6-1 26 (c) CHAN 2
S6-2 27 (d) CHAN 3
S6-3 28 (e) CHAN 4
S6-4 29 (f) CHAN 5
S6-5 30 (g) CHAN 6
S6-6 31 (h) CHAN 7
S6-7 32 (j) CHAN 8
S6-8 33 (k) CHAN 9
S6-9 34 (l) CHAN 10
GND 35 (m) COMMON
36 (-) NOT USED

Figure 6-5A. Main Frame Interconnection Diagram, SR-206/210, Type II FOR REMOTE - CONTROLLED TRANSCEIVERS

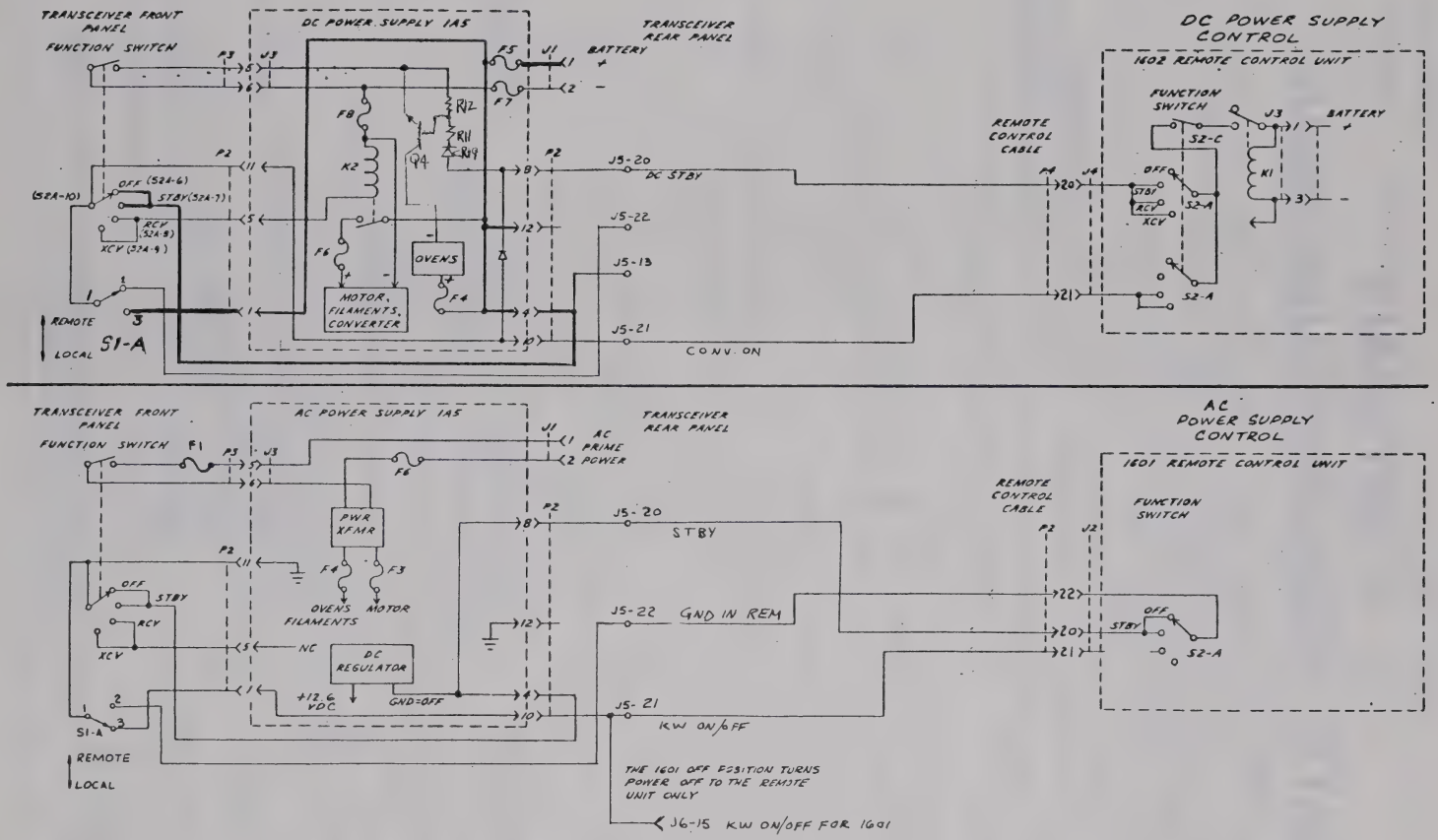


Figure 6-6. AC/DC Remote Control, Simplified Schematic Diagram

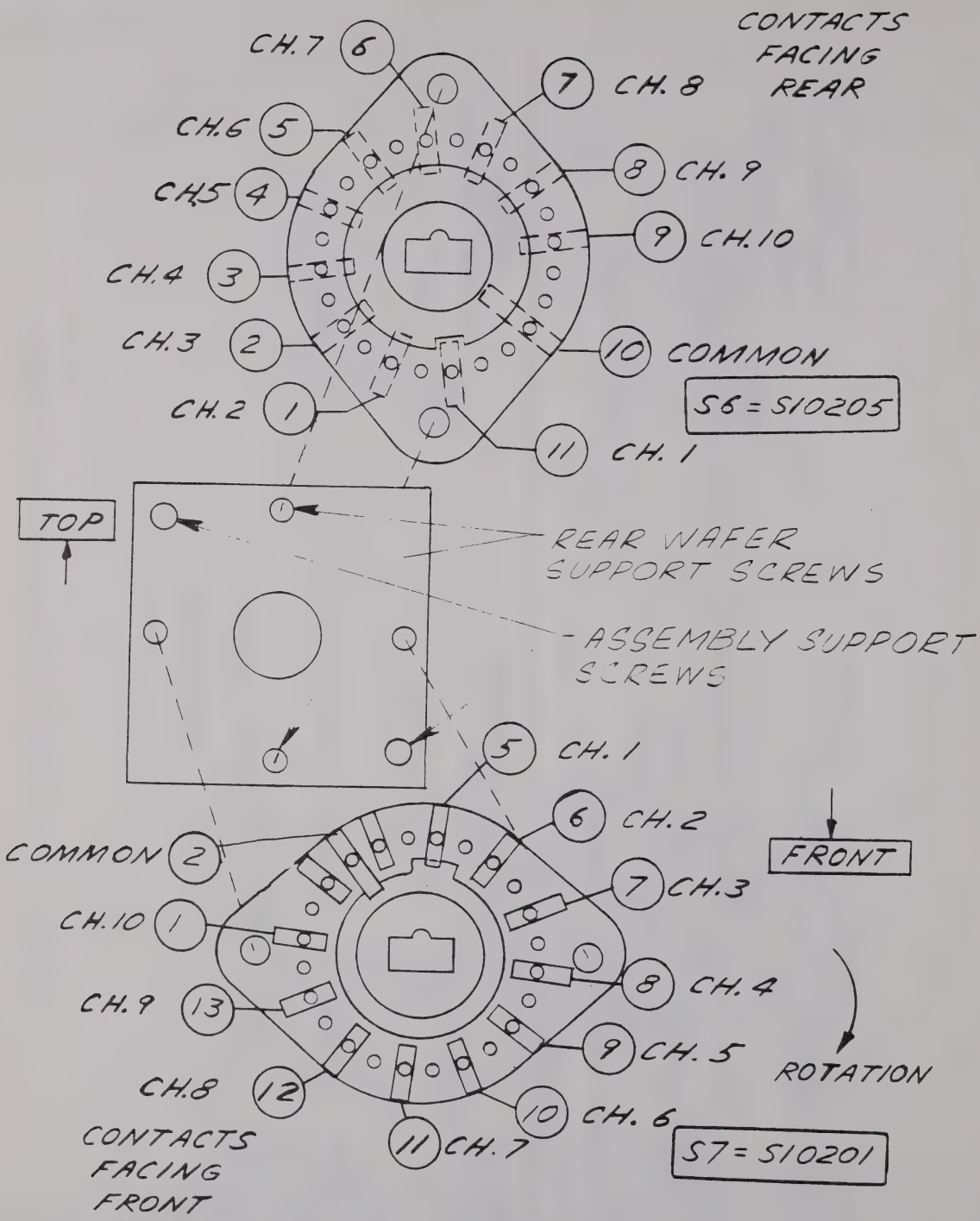


Figure 6-7. Channel Control Input Switch S6 and Channel Control Output (Coupler or LPA) Switch S7

CHAPTER 7
AUDIO OUTPUT ASSY A1A2

The Audio Output Board, located on the front panel, provides the gain necessary to deliver 4 Watts to the speaker. The speaker (and transformer on the main frame) are driven by Q4 and Q5, push-pull amplifiers, which in turn are driven by emitter followers Q2 and Q3. Q1 provides the phase splitting necessary without a transformer input. Q6 is a preamplifier. CR2 and CR3 provide temperature compensation for output quiescent current control.

REF DESIG	DESCRIPTION	P/N
---	AUDIO OUTPUT PC BOARD ASSEMBLY	200090
C1	Cap, tant, 1 μF, 10%, 35 Vdcw	C41056
C2	Cap, tant, 22 μF, 10%, 15 Vdcw	C42263
C3	Cap, tant, 22 μF, 10%, 15 Vdcw	C42263
C4	Not used	---
C5	Cap, cer, 0.1 μF, +80-20%, 25 Vdcw	C11000
C6	Cap, cer, .01 μF, 10%, 500 Vdcw	C10100
C7	Cap, cer, 0.1 μF, +80-20%, 25 Vdcw	C11000
C8	Cap, tant, 1 μF, 10%, 35 Vdcw	C41056
C9	Cap, tant, 10 μF, 10%, 20 Vdcw	C41064
CR1	Diode, si, signal, 1N4148	CR4148
CR2	Diode, si, signal, 1N4148	CR4148
CR3	Diode, si, signal, 1N4148	CR4148
Q1	Transistor, npn, 2N4123	Q41230
Q2	Transistor, npn, 2N4123	Q41230
Q3	Transistor, npn, 2N4123	Q41230
Q4	Transistor, npn, power, 2N5296	Q52960
Q5	Transistor, npn, power, 2N5296	Q52960
Q6	Transistor, npn, 2N4123	Q41230
R1	Res, comp, 4.7K, 5%, 1/4W	R20472
R2	Res, comp, 2.2K, 5%, 1/4W	R20222
R3	Res, comp, 180Ω, 5%, 1/4W	R20181
R4	Res, comp, 220Ω, 5%, 1/4W	R20221
R5	Res, comp, 1K, 5%, 1/4W	R20102
R6	Res, comp, 1K, 5%, 1/4W	R20102
R7	Res, comp, 3.3K, 5%, 1/4W	R20332
R8	Res, comp, 220Ω, 5%, 1/4W	R20221
R9	Res, comp, 220Ω, 5%, 1/4W	R20221
R10	Res, comp, 1.5Ω, 5%, 1/2W	R301R5

AUDIO OUTPUT PC BD ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
R11	Res, comp, 1.5Ω, 5%, 1/2W	R301R5
R12	Not used	---
R13	Res, comp, 100Ω, 5%, 1/4W	R20101
R14	Res, comp, 27K, 5%, 1/4W	R20273
R15	Res, comp, 2.2K, 5%, 1/4W	R20222
R16	Res, comp, 4.7K, 5%, 1/4W	R20472
R17	Res, comp, 270Ω, 5%, 1/4W	R20271

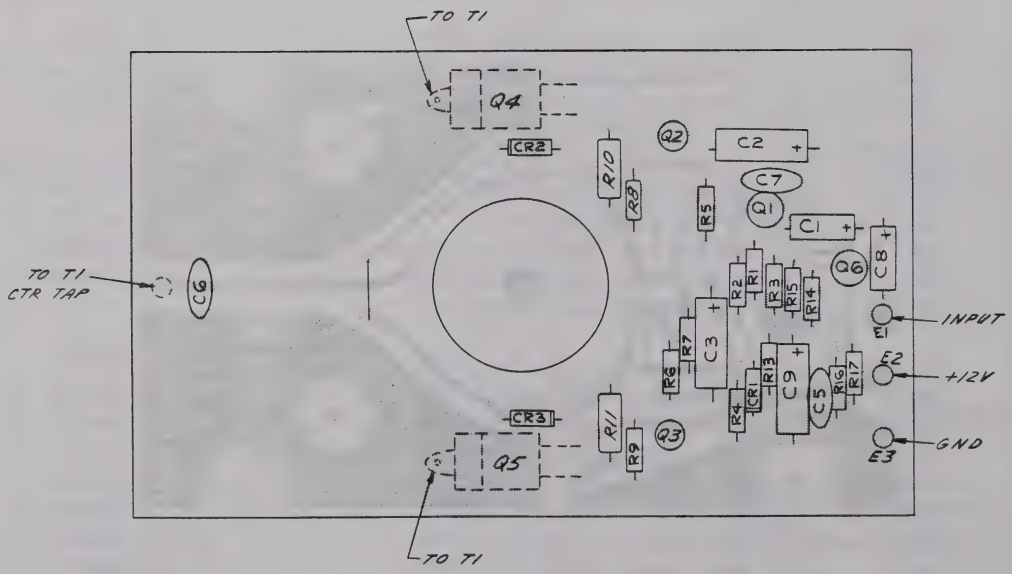
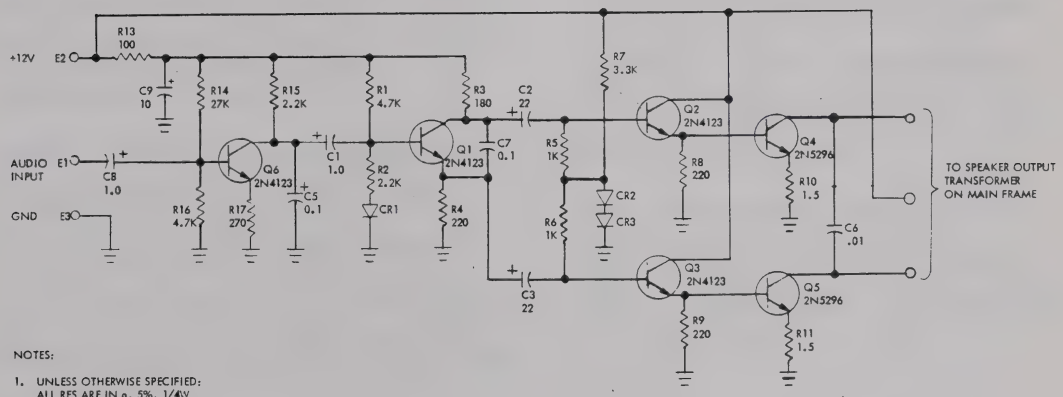


Figure 7-1. Audio Output Assembly



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RES ARE IN Ω, 5%, 1/4W
   ALL CAP ARE IN μF
2. REPLACEMENT SEMICONDUCTOR TYPES ARE SPECIFIED. OTHER TYPES MAY BE USED BY THE FACTORY.

Figure 7-2. Audio Output Assy A1A2, Schematic Diagram

CHAPTER 8
PA MATCHING NETWORK ASSY A2

TABLE OF CONTENTS

----------	General Description
----------	Parts List
Figures 8-1 & 8-2	Front and Bottom Views
Figure 8-3	Input Capacitor Assy A2A1
Figure 8-4	Schematic Diagram

The plate supply and loading for the power amplifier tubes is provided by the A2 Matching Network Assembly. Plate parasitic suppressor chokes L1, L2, and L3 are connected to plate supply choke L4 which is connected to the +750 supply.

Matching the plate impedance of the transceiver is accomplished by the Pi Network consisting of input capacitors C6 and C7, Series Coils L5 and L6, series capacitors C12 and C13, and output capacitors C8 and C9. (A second harmonic trap consisting of L7 and C14 provides additional second harmonic attenuation for marine-type sets only.)

The input capacitor is selected by S1-A, and the output module assembly by S1-C and S1-D. The output module assembly consists of C8 and C9, C12 and C13, (and C14 and L7). (S1-E, an open-seeking wafer, connects a damping resistor across each of the second harmonic traps except the one in use.)

Neutralization of the power amplifier is accomplished by feedback from the plate circuit through neutralizing capacitor C10, blocking capacitor C1, to the plate circuit of 1A3A1V2 on the RF Amplifier and Mixer Board.

REF DESIG	DESCRIPTION	P/N
---	PA MATCHING NETWORK	210200
A2A1	Input Capacitor PC Board Assembly	210203
A2A2	Coil Assembly	200205
A2A3 thru A12	Output Module Assembly, as listed below:	210206-
	2.0-2.25 MHz	001
	2.25-2.5 MHz	002
	2.5-3.0 MHz	003
	3.0-3.5 MHz	004
	3.5-4.0 MHz	005
	4.0-4.5 MHz	061
	4.5-5.0 MHz	062
	5.0-5.5 MHz	071
	5.5-6.0 MHz	072
	6.0-7.0 MHz	008
	7.0-8.0 MHz	009
	8.0-9.0 MHz	101
	9.0-10.0 MHz	102
	10.0-11.0 MHz	111
	11.0-12.0 MHz	112
	12.0-13.0 MHz	121
	13.0-14.0 MHz	122
	14.0-15.0 MHz	131
	15.0-16.0 MHz	132
	16.0-17.0 MHz	141
	17.0-18.0 MHz	142
	18.0-19.0 MHz	151
	19.0-20.0 MHz	152
	20.0-21.0 MHz	161
	21.0-22.0 MHz	162
C1	Not used	---
C2	Cap, cer, .01μF, 1.6 kVdcw	C00001
J1	Lug, quick-disconnect, single 45°	J00155
J2	Lug, quick-disconnect, single 45°	J00155
L1	Choke, parasitic, 4t no. 22 on R40470	L20002
L2	Choke, parasitic, 4t no. 22 on R40470	L20002
L3	Choke, parasitic, 4t no. 22 on R40470	L20002
L4	Choke, plate	L20001
P1	Plug, phono	P00101
P2	Plug, phono	P00101
P3	Socket, quick-disconnect, 0.030	J00151

REF DESIG	DESCRIPTION	P/N
R1-R2	Not used	---
R3-R12	Res, comp, 330Ω, 5%, 1/2W	R30331
S1-A	Switch wafer, 1 pole, 10 pos	S10200
S1-B	Switch wafer, 1 pole, 10 pos	S10200
S1-C	Switch wafer, 1 pole, 10 pos	S10200
S1-D	Switch wafer, 1 pole, 10 pos	S10200
S1-E	Switch wafer, 10 pos, open-seeking	S10205
A1	INPUT CAPACITOR PCB ASSY	210203
A1C1	Cap, cer, .01μF, 1.6 kVdcw	C00001
A1C2-C5	Not used	---
A1C6	Cap, cer, 5%, 1KV as listed below:	
	2.0-2.5 MHz, 560pF	C00014
	2.5-3.0 MHz, 470pF	C00013
	3.0-3.5 MHz, 390pF	C00012
	3.5-4.0 MHz, 330pF	C00011
	4.0-5.0 MHz, 220pF	C00016
	5.0-6.0 MHz, 180pF	C00009
	6.0-7.0 MHz, 150pF	C00008
	7.0-8.0 MHz, 120pF	C00017
	8.0-10.0 MHz, 100pF	C00007
	10.0-12.0 MHz, 68pF	C00006
	12.0-14.0 MHz, 56pF	C00018
	14.0-16.0 MHz, 39pF	C00005
	16.0-18.0 MHz, 33pF	C00019
	18.0-20.0 MHz, 27pF	C00020
	20.0-22.0 MHz, 22pF	C00004
A1C7	Cap, cer, 5%, 1KV, as listed below:	
	2.0-2.5 MHz, 180pF	C00009
	2.5-30.0 MHz, None Required	---
A1C8-C9	Not used	---
A1C10	Cap, cer, 3.3pF, 5%, np0	C00015
A1R1	Res, comp, 2.2 meg, 5%, 1/2W	R30225
A1R2	Res, comp, 2.2 meg, 5%, 1/2W	R30225
A2	COIL ASSY	200205
A2C1-C10	Not used	---
A2C11	Cap, mica, 15pF, 5%, 500 Vdcw	C05150
A2L1-L4	Not used	---
A2L5	Coil, rf, 6t no. 14 on 1/2 in dia	L20005
A2L6	Coil, rf, Air-dux	L20004

PA MATCHING NET ASSY A2

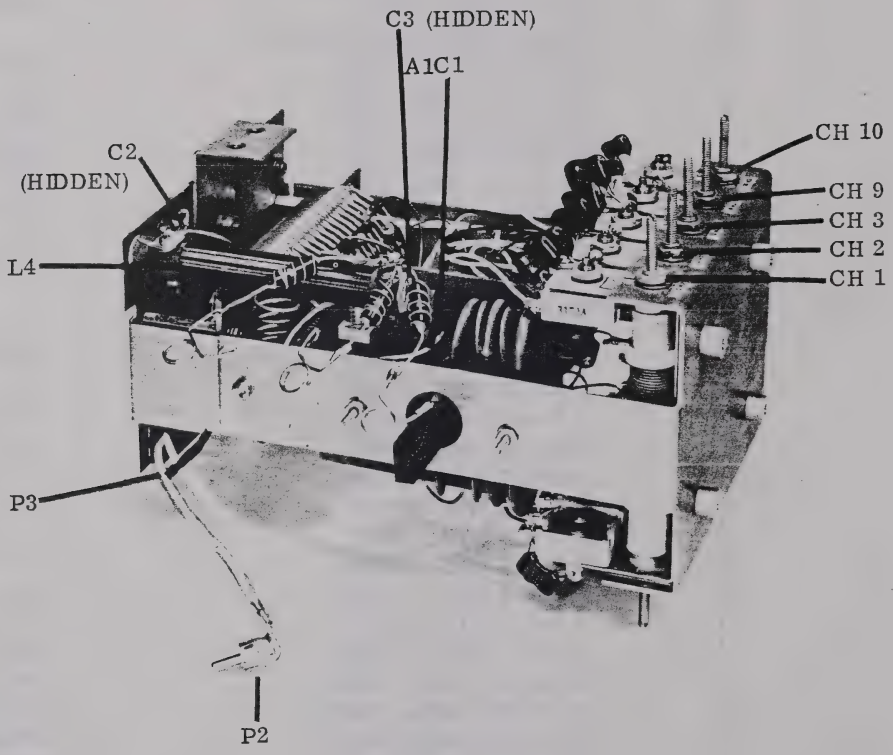
REF DESIG	DESCRIPTION	P/N
A3-A13	OUTPUT MODULE ASSY (hereinafter called A( )).	210206-( )
	NOTE: The values of C8 and C9 in brackets are the values required without harmonic traps.	
A( )C1-C7	Not used	---
A( )C8	Cap, mica, 5%, 500 V, as listed below:	
	2.0-2.5 MHz 1500pF (2000pF)	C06152 (C06202)
	2.5-3.0 MHz 1500pF (1500pF)	C06152 (C06152)
	3.0-3.5 MHz 1200pF (1500pF)	C06122 (C06152)
	3.5-4.0 MHz 820pF (1500pF)	C06821 (C06152)
	4.0-5.0 MHz 680pF (910pF)	C06681 (C06911)
	5.0-5.5 MHz 560pF (910pF)	C06561 (C06911)
	5.5-6.0 MHz 680pF (910pF)	C06681 (C06911)
	6.0-7.0 MHz 560pF (680pF)	C06561 (C06681)
	7.0-8.0 MHz 470pF (680pF)	C06471 (C06681)
	8.0-12.0 MHz 330pF (470pF)	C05331 (C06471)
	12.0-13.0 MHz 270pF (360pF)	C05271 (C05361)
	13.0-14.0 MHz 300pF (360pF)	C05301 (C05361)
	14.0-15.0 MHz 270pF (330pF)	C05271 (C05331)
	15.0-16.0 MHz 180pF (330pF)	C05181 (C05331)
	16.0-17.0 MHz 180pF (300pF)	C05181 (C05301)
	17.0-18.0 MHz 180pF (220pF)	C05181 (C05221)
	18.0-19.0 MHz 160pF (220pF)	C05161 (C06221)
	19.0-20.0 MHz 150pF (270pF)	C05151 (C06271)
	20.0-21.0 MHz 130pF (220pF)	C05131 (C06221)
	21.0-22.0 MHz 130pF (270pF)	C05131 (C06271)

REF DESIG	DESCRIPTION	P/N
A( )C9	Cap, mica, 5%, 500V, as listed below:	
	2.0-2.5 MHz, 1200pF	C06122
	(1500pF)	(C06152)
	2.5-3.0 MHz, Not used	---
	(620pF)	(C06621)
	3.0-3.5 MHz, Not used	---
	(330pF)	(C05331)
	3.5-4.0 MHz, 270pF	C05271
	(Not used)	(---)
	4.0-5.0 MHz, 30pF	C05300
	(100pF)	(C05101)
	5.0-5.5 MHz, 130pF	C05131
	(Not used)	(---)
	5.5-6.0 MHz, 68pF	C05680
	(Not used)	(---)
	6.0-7.0 MHz, Not used	---
	(120pF)	(C05121)
	7.0-8.0 MHz, 39pF	C05390
	(22pF)	(C05220)
	8.0-9.0 MHz, Not used	---
	(120pF)	(C05121)
	9.0-10.0 MHz, 82pF	C05820
	(130pF)	(C05131)
	10.0-13.0 MHz, Not used	---
	(Not used)	(---)
	13.0-14.0 MHz, Not used	---
	(47pF)	(C05470)
	14.0-17.0 MHz, Not used	---
	(Not used)	(---)
	17.0-18.0 MHz, Not used	---
	(100pF)	(C05101)
	18.0-19.0 MHz, Not used	---
	(62pF)	(C05620)
	19.0-20.0 MHz, Not used	---
	(Not used)	(---)
	20.0-21.0 MHz, 20pF	C05200
	(39pF)	(C05390)
	21.0-22.0 MHz, 10pF	C05100
	(Not used)	(---)

PA MATCHING NET ASSY A2

REF DESIG	DESCRIPTION	P/N
A( )C10-C11	Not used	---
A( )C12	Cap, mica, var, 500V, as listed below:	
	2.0-3.0 MHz, 1200-2525pF	C63007
	3.0-3.5 MHz, 800-1970pF	C63008
	3.5-5.0 MHz, 615-1600pF	C63001
	5.0-8.0 MHz, 425-1260pF	C63006
	8.0-14.0 MHz, 180-690pF	C63002
	14.0-22.0 MHz, 100-500pF	C63003
A( )C13	Cap, mica, 5%, 500V, as listed below:	
	2.0-3.0 MHz, 390pF	C05391
	3.0-3.5 MHz, 150pF	C05151
	3.5-5.0 MHz, None Required	---
	5.0-6.0 MHz, 68pF	C05680
	6.0-8.0 MHz, None Required	---
	8.0-10.0 MHz, 120pF	C05121
	10.0-12.0 MHz, 68pF	C05680
	12.0-14.0 MHz, 47pF	C05470
	14.0-16.0 MHz, 68pF	C05680
	16.0-18.0 MHz, 47pF	C05470
	18.0-20.0 MHz, 33pF	C05330
	20.0-21.0 MHz, 22pF	C05220
	21.0-22.0 MHz, 10pF	C05100
A( )C14	Cap, mica, 5%, 500V, as listed below:	
	2.0-2.25 MHz, 510pF	C06511
	2.25-2.5 MHz, 750pF	C06751
	2.5-3.5 MHz, 470pF	C06471
	3.5-4.0 MHz, 360pF	C05361
	4.0-4.5 MHz, 270pF	C05271
	4.5-5.0 MHz, 220pF	C05221
	5.0-5.5 MHz, 180pF	C05181
	5.5-6.0 MHz, 150pF	C05151
	6.0-7.0 MHz, 160pF	C05161
	7.0-8.0 MHz, 120pF	C05121
	8.0-9.0 MHz, 180pF	C05181
	9.0-10.0 MHz, 150pF	C05151
	10.0-11.0 MHz, 120pF	C05121
	11.0-12.0 MHz, 91pF	C05910
	12.0-13.0 MHz, 82pF	C05820
	13.0-14.0 MHz, 75pF	C05750
	14.0-15.0 MHz, 120pF	C05121
	15.0-16.0 MHz, 100pF	C05101
	16.0-17.0 MHz, 91pF	C05910
	17.0-18.0 MHz, 75pF	C05750
	18.0-19.0 MHz, 68pF	C05680
	19.0-20.0 MHz, 62pF	C05620
	20.0-21.0 MHz, 56pF	C05560
	21.0-22.0 MHz, 51pF	C05510

REF DESIG	DESCRIPTION	P/N
A( )L7	Coil, rf, var, as listed below:	
	2.0-2.25 MHz, 2.3-4.4μH	L32008
	2.25-3.0 MHz, 1.4-2.3μH	L32007
	3.0-6.0 MHz, .95-1.7μH	L32006
	6.0-8.0 MHz, .65-1.1μH	L32005
	8.0-14.0 MHz, .4-.7μH	L32004
	14.0-22.0 MHz, .24-.38μH	L32003



P2 - Relative Power (To A3A2J2)
P3 - Neutralization (To A3J3)

Figure 8-1. Matching Network Module Assembly, Front View

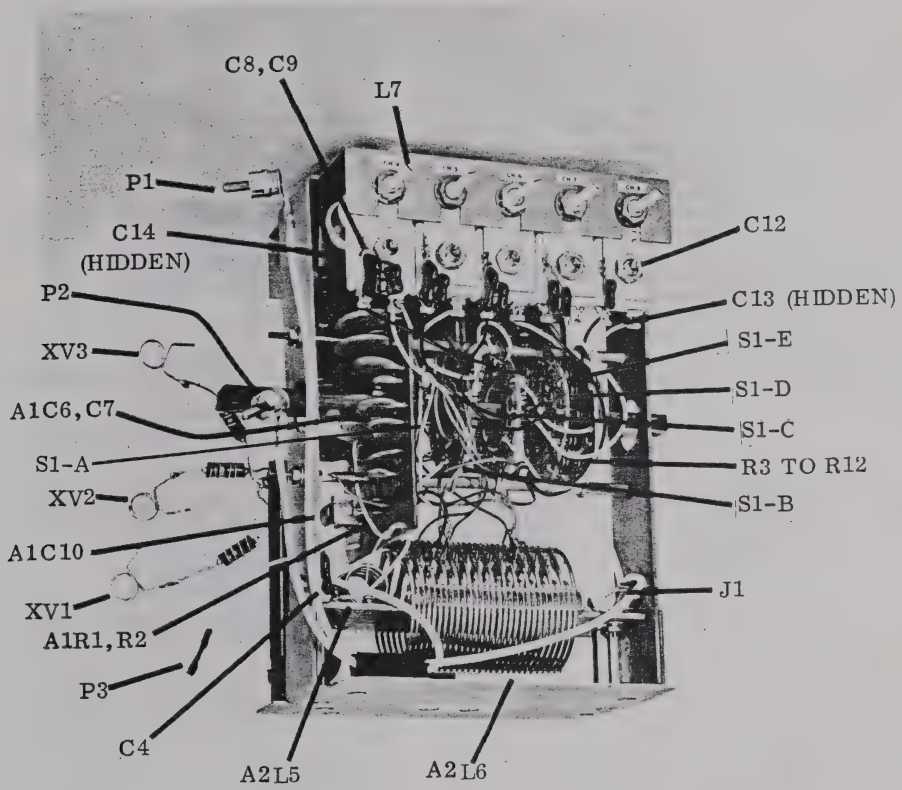


Figure 8-2. Matching Network Module Assembly, Bottom View

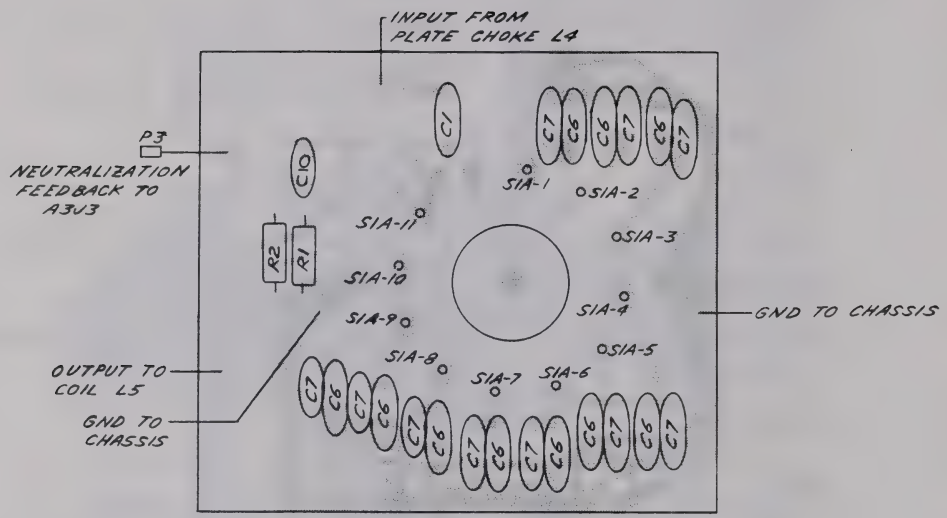
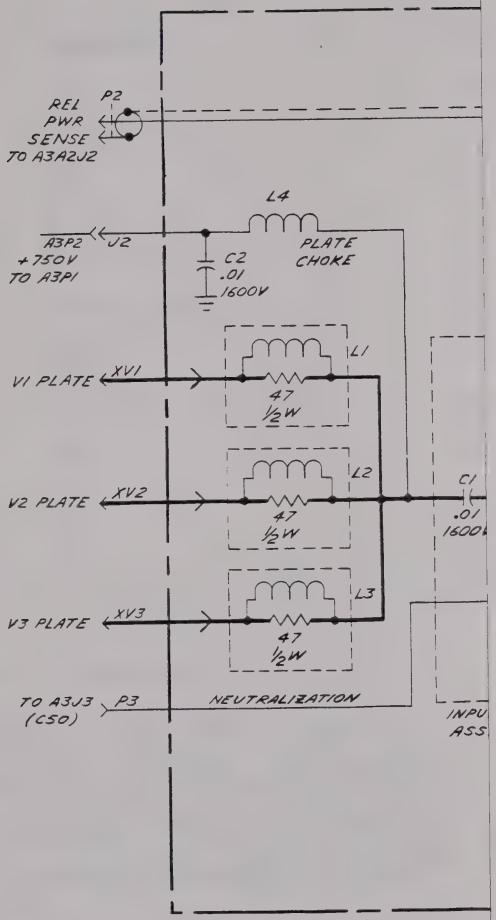


Figure 8-3. Input Capacitor PC Board Assembly A2A1



NOTES:

1. CAPACITOR VALUES, IN POSITIONS 1,2,3,4,5&6 ON S1-A, S1-B AND S1-C, C6, C7, C8, C9 AND TAP POSITION OF L6 ARE DETERMINED BY CHANNEL FREQUENCY
2. COMPONENTS IN POSITION 7,8,9&10 ON S1-D, AND S1-E, ARE SELECTED PER NOTE 1. THESE COMPONENTS ARE USED ON 10 CHANNEL UNITS ONLY.
3. OUTPUT MODULE COMPONENT VALUES C8, C9, C12, C13, C14 AND L7; TAP POSITION OF L6; AND INPUT CAPACITOR VALUES C6&C7 ARE DETERMINED BY CHANNEL FREQUENCY. SEE TABLE 4-5.
4. THE TAPS ARE CODED, CH 1 BROWN, CH 2 RED, CH 3 ORANGE, ETC., NORMAL COLOR CODE.
5. C14, L7, R3-R12, & S1-E DELETED WHEN HARMONIC TRAP IS NOT USED.

Figure 8-4. PA Matching Network A2, Schematic Diagram

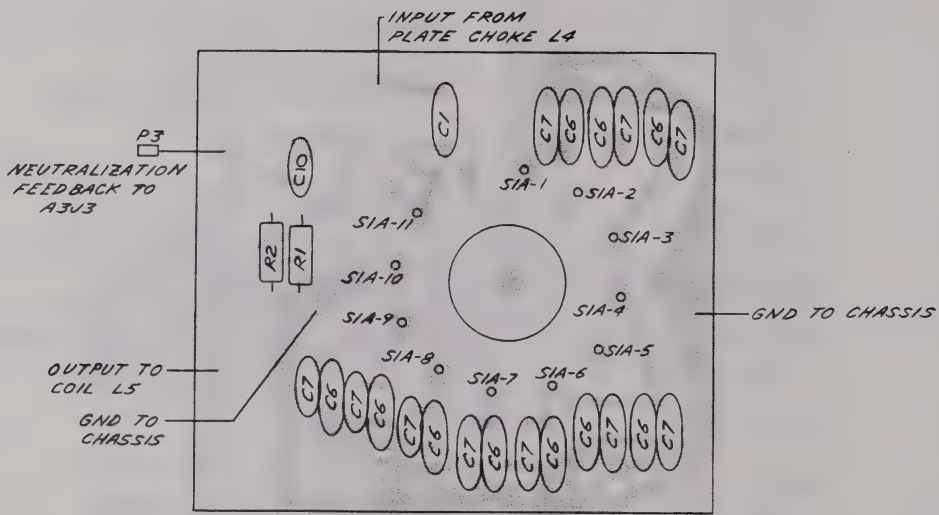
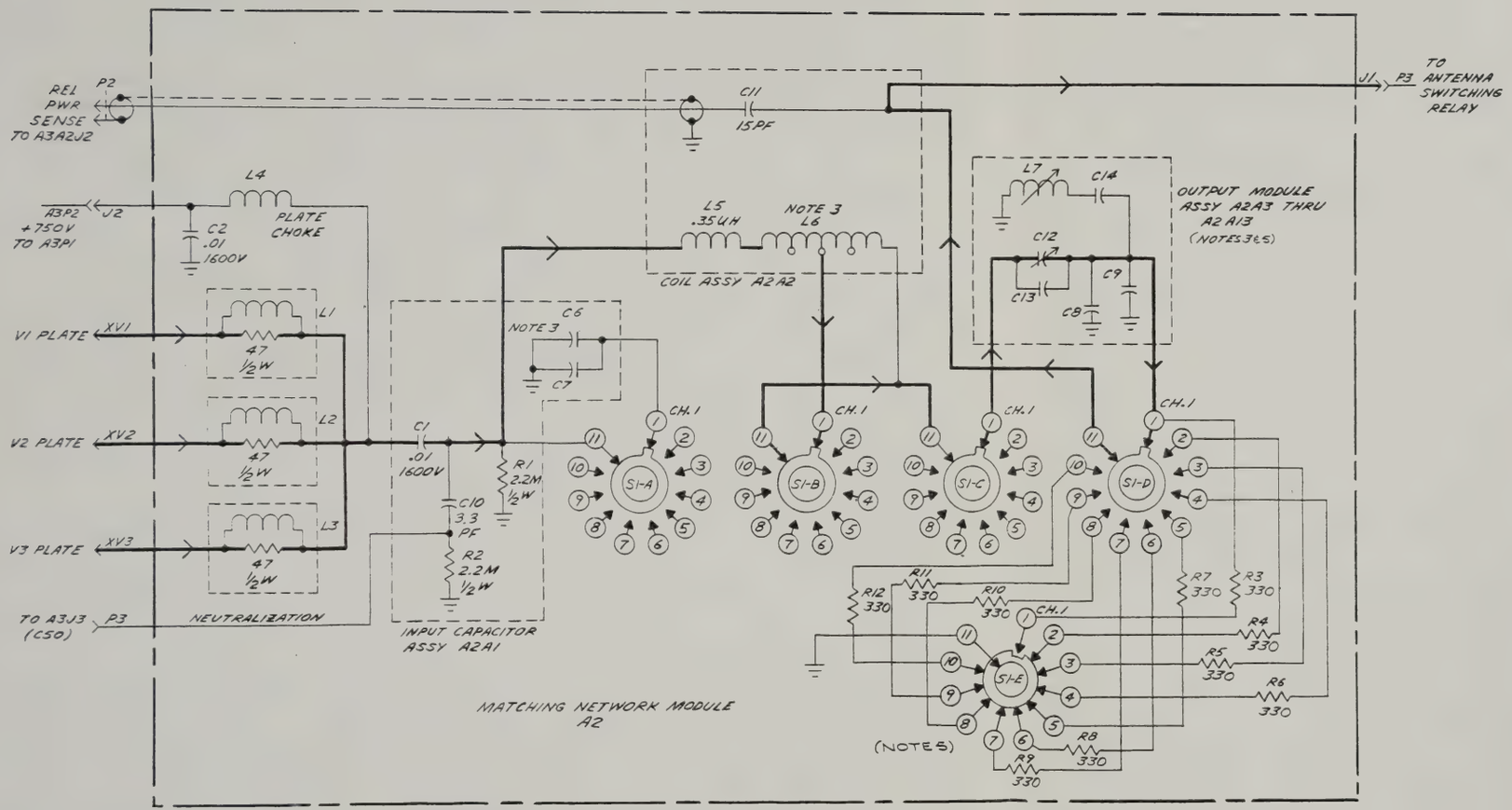


Figure 8-3. Input Capacitor PC Board Assembly A2A1



NOTES:

1. CAPACITOR VALUES, IN POSITIONS 1,2,3,4,5&6 ON S1-A, S1-B AND S1-C, C6, C7, C8, C9 AND TAP POSITION OF L6 ARE DETERMINED BY CHANNEL FREQUENCY
2. COMPONENTS IN POSITION 7,8,9&10 ON S1-D, AND S1-E, ARE SELECTED PER NOTE 1. THESE COMPONENTS ARE USED ON 10 CHANNEL UNITS ONLY.
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4. THE TAPS ARE CODED, CH1 BROWN, CH2 RED, CH3 ORANGE, ETC., NORMAL COLOR CODE.
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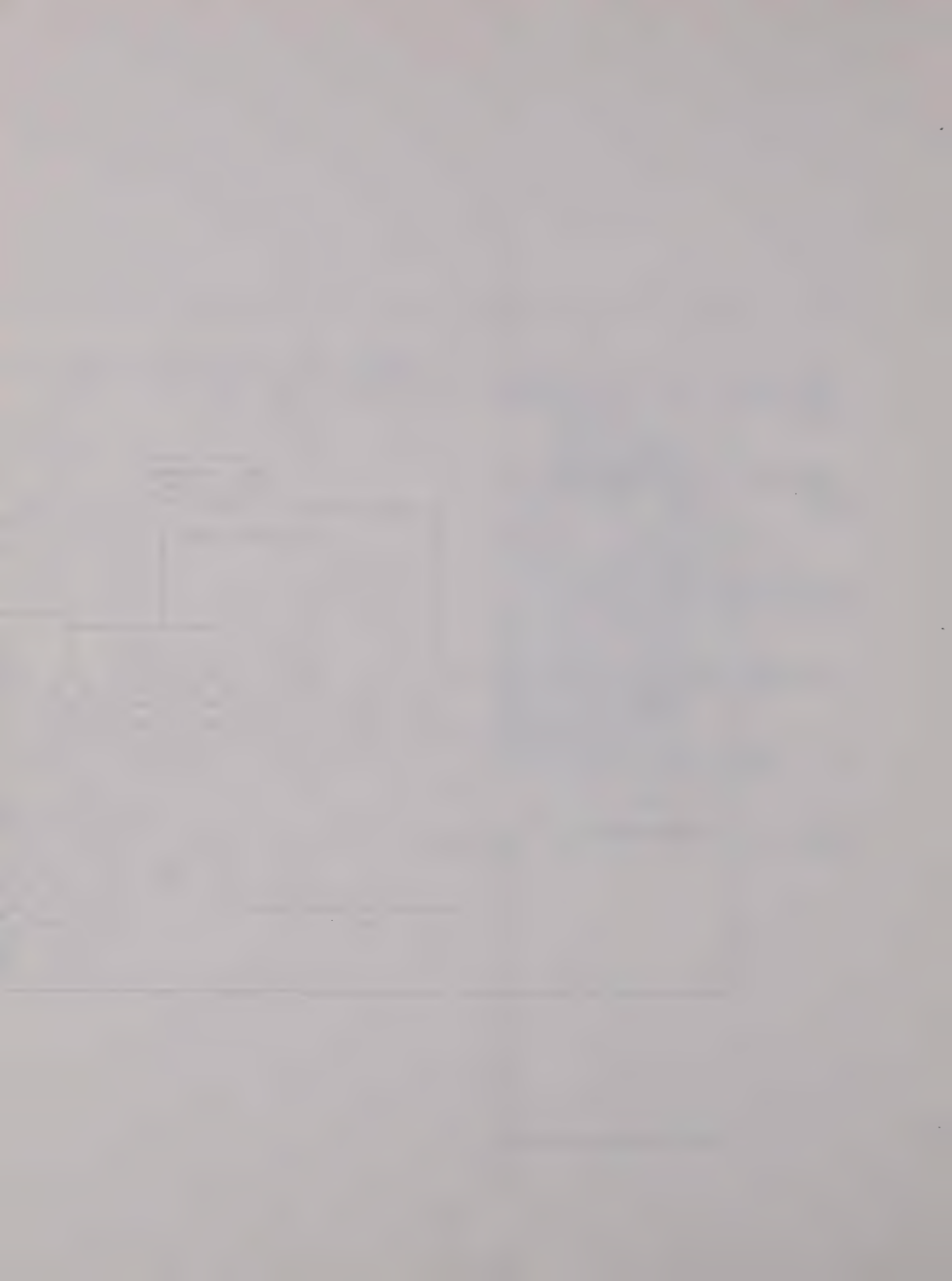
Figure 8-4. PA Matching Network A2, Schematic Diagram



CHAPTER 9
RF AMPLIFIER ASSY A 3

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9.1 GENERAL.

The RF Amplifier Module contains several sub-units or functions: the RF Amplifier/ Mixer PC Board, the channel switch assembly, the power amplifier, the Power Control PC Board, the Channel Tuning Strips, and the Duplex Switching Board (206M/ 210M).

9.2 CHANNEL SWITCH ASSEMBLY.

The channel switch assembly contains all the switching, up through the grids of the 6146B power amplifier tubes necessary when switching to a specific channel. S2B and S2C select the input tuned circuit of V1; S2D connects R2, the transmit gain adjustment potentiometer in the circuit; S2E and S2F select the input and output tuned circuits of V2. In the 206M/210M, S2G and S2H are provided to switch the marine channel tune strip to duplex. Also located on the assembly are the 22 pin connectors into which the individual channel strips and the duplex switching board plug in. These channel strips contain L1, L2, L3, and L4 and associated components necessary for channel tuning.

9.3 RF AMPLIFIER/MIXER BOARD A3A1.

On receive, the rf signal from the antenna passes through the antenna switching relay A1K1 through J2 to K1, the transmit/receive

relay. K1 is shown in the receive position. K1 connects the signal to S2B. The received signal passes through a tuned circuit to the grid of V1, the rf amplifier stage. This tube is used on both receive and transmit. After amplification by V1, the signal is applied through C4 to G1 of Q1, a dual gate fet, which functions as the receive mixer. The channel oscillator injection signal, at a frequency 1.5 MHz (or alternate) above the receive frequency, is amplified by Q2 and applied to G2 of Q1. Q2 is a broadband amplifier which requires no tuning. Circuitry consisting of R5, R6, R7, CR1, CR3, and C3 serves the dual function of biasing Q1 on in receive and off in transmit and, in addition, effectively connects C3 in the circuit on receive. This is required since the input capacitance of V2 is lower in receive since it is biased off. The output of Q1 is applied to a double tuned circuit, tuned to if frequency, comprised of T1 and T2 and associated components. This double tuned circuit functions on receive and transmit. The output on receive is taken from a link on T1 and goes to IF/Audio Board A4.

In the transmit mode, the signal at 1500 kHz (or alternate) comes in from the IF/Audio Board through T1, T2, to G1 of Q3, a dual gate fet, which is biased on in transmit and off in receive. It is amplified, passed through a 1500 kHz or 1400 kHz tuned circuit to U1, the transmit mixer. U1 is a MC1596G, an IC operating as a balanced mixer with a high degree of injection frequency balance. The IF signal is mixed with the injection signal which is at a frequency 1500 kHz or alternate 1400 kHz above the desired output frequency. R21 adjusts the balance of the mixer to null out the injection frequency. The mixer output is amplified by U2 and applied to K1. T4 and T5 are broadband transformers. The output at this point consists of the desired signal plus the other mixing product at a frequency 2.8 to 3 MHz above the desired. The tuned circuits in the channel strips eliminate the unwanted mixing product. The signal passes through K1 which on transmit connects the output of T5 to S2-B. The tuned circuits associated with L2 and L3 of the channel strips operate on receive and transmit. The tuned circuit associated with L4 at the output of V2 functions only on transmit. The output of V2 is coupled through C47 to the grids of the 6146B PA tubes. V2 is biased off on receive since its cathode resistor is connected to the +12V Receive/ground on transmit line. The bias on V1 is adjusted by the channel transmit level control located on the channel tuning strips on transmit and supplied by the RF Amplifier AGC on receive.

Neutralization of the PA is supplied through C50 to C48, the low side of the interstage tuned circuit associated with the plate of V2. The phase reversal produced cancels out the direct plate to grid feedback.

The transmit/receive relay also furnishes +12 receive/ground transmit and +12 transmit/ground receive signals to other modules in the transceiver to accomplish required switching functions. The relay is operated by a ground supplied from A4, the IF/Audio Board.

A solid state FET amplifier is available as an option that can be inserted to replace V1, the RF Amplifier. With this option the receiver is completely solid-state.

9.4 POWER AMPLIFIER.

The power amplifier stage consists of three type 6146B tetrode vacuum tubes, V1, V2, and V3, connected in parallel. Grid bias is provided by Idle Current Control R4 on the PPC (A2) board. Bias control R4 is adjusted for a no signal cathode idling current of 25 mA per tube, which operates the tube class AB1.

An indication of cathode current is obtained by measuring the voltage drop across cathode resistors R4, R7, and R10. The voltage appearing at the cathode connection of these resistors is applied to a metering circuit at the junction of isolating resistor R3, R6, and R9. The metering circuit consists of series limiting resistor R1, RF filter L7, C1 and C2, meter switch S1, and front panel meter M1. Cathode voltage is also applied to the PPC (A2) board, which will be discussed in subsequent paragraphs. An indication of 40 on the front panel meter corresponds to a total idling current of 75 mA, or 25 mA per tube. The slide switch S1 of A3 must be in the cathode current position to make the measurement but must be returned to the REL PWR position for normal operation.

The rf signal input to the power amplifier is applied via the three grid circuit parasitic suppressors, L1, L2, and L3. A screen bias voltage of +215 Vdc is applied to the power amplifier tubes by resistors R2, R5, and R8. The screen bias is obtained by dropping the +240 Vdc supply voltage through Zener diode VR1. This supply voltage is switched by antenna relay K1 so that it is present only when the Transceiver is keyed. Thus the power amplifier tubes have screen voltage only when the Transceiver is keyed.

9.5 POWER CONTROL (ACC/PPC) BOARD A3A2.

This board is shown pictorially in Figure 9-4. Peak power control of the amplifier is achieved by sampling the power amplifier grid voltage. Refer to schematic diagram Figure 9-7.

On normal voice signal drive, the grid voltage at the pa is always negative. When voice peaks occur which are sufficient to overdrive the grid, the positive envelope peaks cause grid current to flow. The resulting series of pulses is ac coupled to Q5 through blocking capacitor C12. The pulses are amplified in Q5 and the first transistor in U2, and they are integrated by fast attack/slow release emitter circuit R40, R41, C17 to provide a varying dc output proportional to the amount of overdrive. After amplification in the succeeding emitter follower, the ppc output is applied to the IF/Audio Board to limit the drive level. There is no adjustment for ppc, since it is self-regulating according to the capabilities of the pa stage to develop power without drawing grid current.

In the optional reduced power mode or in am mode if so desired, an artificial grid current is drawn by CR2-CR4 and CR9-CR10 to lower the peak output power. (See sheet 1 of the schematic diagram.) A positive voltage is applied to the base of Q1, in such modes, as determined by the setting of R8. The bias voltage set by Q1 and R10 is applied to the bottom of the diode string on the pa grid line. By regulating the threshold of conduction in this manner, the level at which artificial grid current begins to flow can be set. Thus, the ppc output can be made to limit the drive to any reduced level desired.

Auxiliary ppc, such as from a linear power amplifier, also can be fed into the base of Q1 to regulate the ppc threshold at a level below full drive. (Refer to schematic sheet 2.) Auxiliary ppc can be routed to Q1 through CR20, E15, and a jumper on the board. A current limit signal also may be applied on that line to Q1 if the pa cathode current exceeds a preset level. The right hand section of U2 (as shown on the schematic) acts as a comparator to provide an output if the current sample at pin 2 exceeds the level applied to pin 4 by R50. The resulting dc signal is amplified by Q6 to be fed in the auxiliary ppc input to Q1.

In FSK mode, the continuous tone signal ordinarily would not result in ppc on overdrive because no pulses are produced at Q5. For that reason, Q2 (shown on sheet 1) is employed in FSK mode to sense continous flow of grid current and thereby provide a ppc signal to Q5.

The carrier signal for am or reduced carrier mode is regulated in the IF/Audio Board as a result of an acc signal generated in the Power Control Board. (See schematic sheet 1.)

RF from the pa grid is amplified in Q3 and U1 and detected to provide a dc signal proportional to the carrier level. The R/C/CR circuit at pin 7 of U1 removes the effects of any modulation so that the acc signal responds to carrier only. The acc signal is then amplified by the remaining section of U1 and by Q4 to provide an acc signal to the IF/Audio Board.

The minimum amount of carrier which results in some acc output is established by the fixed dc level at emitter pin 3 of U1. The level corresponds to the level desired in reduced carrier (PCS) mode. In AM mode, the switch transistor (U1 pins 12-13-14) switches AM SET capacitor C9 into the circuit. The result is a reduction in the amount of rf signal being detected, thereby allowing the full AM carrier level to be produced in the IF/Audio Board.

9.6 CHANNEL TUNE STRIPS A3A3 THRU A3A12.

These boards in any combination up to ten provide the necessary tuned circuits for the transmit and receive functions. L2, C4, and L3, C8 are used in receive with L4, C11 added in transmit. Various strapping options are available.

a. Simplex boards - C5, C9 and C13 are added to the tuned circuit when the jumpers shown in Figure 9-5A are installed. The bands so formed are tabulated in Chapter 4. Also available at the input is L1, C1 and C2, the image trap option. The image trap is tuned to a frequency two times the IF frequency above the carrier frequency. C3, C4 and C5 values given in the parts list are modified when an image trap is supplied. Consult the manufacturer when an image trap is to be added in the field.

b. Duplex boards - Jumpers C to L2 and L3 are cut when the duplex board is to be operated simplex. Jumpers A to C6 and C10 are required for additional capacity across either C6 or C10. The combination of these jumpers allows K1 and K2 of the duplex switching board to switch the C6, C5 and C10, C9 combinations across L2 and L3 to lower the tuned frequency. A board with jumpers A and C is the basic duplex board, the bands of which are defined in Chapter 4. The basic board, however, may be converted to a basic simplex configuration and having component values of the simplex board by jumpers as shown in Figure 9-5A. Jumpers B thereby are used to split bands as indicated in Chapter 4. C6 and C10 are deleted in this configuration.

The dashed inductors across C5 and C9 (Figure 9-8) are for special applications where the duplex frequencies are very close. In this case C5 and C9 are replaced by an inductor to cancel out some of the capacity of C6 and C10.

C2 of the image trap has two locations as shown by the dual position arrows on the

schematic. For frequencies below 16 MHz, C2 is connected to the input, pin 2. Above 16 MHz, C2 is connected to pins 3 and 4. This provides the capability of greater selectivity of the front end at higher frequencies by minimizing the detuning effects of the image trap.

9.7 DUPLEX SWITCHING BOARD A3A13.

K1 and K2 are reed relays which on a transmit/receive command switch capacitors across the L2, L3 tuned circuits to lower the frequency. Jumper A is for ship stations (TX frequency lower) and jumper B is for shore stations (TX frequency higher).

RF AMPLIFIER MODULE ASSY

REF DESIG	DESCRIPTION	P/N
---	RF AMPLIFIER MODULE ASSEMBLY	
	6 channel	200300-6
	10 channel	200300-10
	10 channel Duplex	200300-10D
A1	RF Amplifier & Mixer PC Board Assembly	200370
A2	Power Control PC Board Assembly	210370
A3 thru A12	Channel Tuning PC Board Assembly, as listed below:	
	Simplex, 206/210	
	1.6-2.5 MHz	200390-1
	2.5-3.5 MHz	200390-2
	3.5-5.5 MHz	200390-3
	5.5-8.0 MHz	200390-4
	8.0-12.0 MHz	200390-5
	12.0-18.0 MHz	200390-6
	18.0-24.0 MHz	200390-7
	24.0-30.0 MHz	200390-8
	Duplex, 206M/210M	
	2.0-2.25 MHz	200393-1
	2.25-2.5 MHz	200393-2
	2.5-3.0 MHz	200393-3
	3.0-3.5 MHz	200393-4
	3.5-4.0 MHz	200393-5
	4.0-5.0 MHz	200393-6
	5.0-6.0 MHz	200393-7
	6.0-7.0 MHz	200393-8
	7.0-8.0 MHz	200393-9
	8.0-10.0 MHz	200393-10
	10.0-12.0 MHz	200393-11
	12.0-14.0 MHz	200393-12
	14.0-16.0 MHz	200393-13
	16.0-18.0 MHz	200393-14
	18.0-20.0 MHz	200393-15
	20.0-22.0 MHz	200393-16
A13	Duplex Switching PC Board Assembly	200387
A14	Automatic Carrier PC Board Assembly	200381
C1	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C2	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C3	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C4	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C5	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000

RF AMPLIFIER MODULE ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
C6	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C7	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C8	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C9	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C10	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C11	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C12	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C13	Cap, elect, 200μF, 350 Vdcw	C70004
C14	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C15	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C16	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C17	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C18	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C19	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C20	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
CR1-CR4	Diode, si, 1 Amp, 200V, 1N4003	CR4003
J1	Recept, 4 pin	J00200
J2	Recept, phono, bulkhead mtg	J00100
J3	Terminal, feedthru	E10004
J4	Not used	---
J5	Recept, phono, bulkhead mtg	J00100
L1	Choke, parasitic, 3t no. 22 on R30470	L20003
L2	Choke, parasitic, 3t no. 22 on R30470	L20003
L3	Choke, parasitic, 3t no. 22 on R30470	L20003
L4	Inductor, toroid	L32025
L5-L6	Not used	---
L7	Choke, rf, 47μH	L10470
P1	Plug, 8 pin, octal style	P00701
P2	Lug, female, quick-disconnect	P00155
R1	Res, comp, 10Ω, 5%, 1/4W	R20100
R2	Res, comp, 470Ω, 5%, 1/4W	R20471
R3	Res, comp, 100Ω, 5%, 1/4W	R20101
R4	Res, comp, 3.9Ω, 5%, 1/4W	R203R9
R5	Res, comp, 470Ω, 5%, 1/4W	R20471
R6	Res, comp, 100Ω, 5%, 1/4W	R20101
R7	Res, comp, 3.9Ω, 5%, 1/4W	R203R9
R8	Res, comp, 470Ω, 5%, 1/4W	R20471
R9	Res, comp, 100Ω, 5%, 1/4W	R20101
R10	Res, comp, 3.9Ω, 5%, 1/4W	R203R9
R11	Res, comp, 180Ω, 5%, 1/2W	R30181
R12	Res, comp, 100K, 5%, 1W	R40104

RF AMPLIFIER MODULE ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
R13	Not used	---
R14	Res, ww, 12Ω, 12W	R90002
S1	Switch, slide, dpdt	S00202
S2	Switch wafer, detent assy	S10507
S2-B	Switch wafer, 1 pole, 11 pos, shorting	S10100
S2-C	Switch wafer, 1 pole, 11 pos, shorting	S10100
S2-D	Switch wafer, 1 pole, 11 pos, shorting	S10100
S2-E	Switch wafer, 1 pole, 11 pos, shorting	S10100
S2-F	Switch wafer, 1 pole, 11 pos, shorting	S10100
S2-G	Switch wafer, 1 pole, 11 pos, shorting	S10100
S2-H	Switch wafer, 1 pole, 11 pos, shorting	S10100
S3	Switch, slide, dpdt, slot, unmarked	S00201
V1	Tube, electron, 6146B	V6146B
V2	Tube, electron, 6146B	V6146B
V3	Tube, electron, 6146B	V6146B
VR1	Diode, zener, 33V, 5%, 10W, 1N1363A	VR1363
XA3	Connector, pc, 22 pin	X00803
XA4	Connector, pc, 22 pin	X00803
XA5	Connector, pc, 22 pin	X00803
XA6	Connector, pc, 22 pin	X00803
XA7	Connector, pc, 22 pin	X00803
XA8	Connector, pc, 22 pin	X00803
XA9	Connector, pc, 22 pin	X00803
XA10	Connector, pc, 22 pin	X00803
XA11	Connector, pc, 22 pin	X00803
XA12	Connector, pc, 22 pin	X00803
XA13	Connector, pc, 22 pin	X00803
XV1	Socket, octal type, 8 pins	X00701
XV2	Socket, octal type, 8 pins	X00701
XV3	Socket, octal type, 8 pins	X00701
---	Ferrite bead	FL0003

RF AMPLIFIER & MIXER PC BD ASSY A1

REF DESIG	DESCRIPTION	P/N
---	RF AMPLIFIER & MIXER PC BOARD ASSY	200370
C1	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C2	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C3	Cap, mica, 7pF, 5%, 100 Vdcw	C04070
C4	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C5	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C6	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C7	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C8	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C9	Cap, mica, 510pF, 5%, 500 Vdcw	C06511
	(for 1.4 MHz IF, 560pF)	(C06561)
C10	Cap, mica, 12pF, 5%, 500 Vdcw	C05120
	(for 1.4 MHz IF, 15pF)	(C05150)
C11	Cap, mica, 510pF, 5%, 500 Vdcw	C06511
	(for 1.4 MHz IF, 560pF)	(C06561)
C12	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C13	Cap, tant, 0.1μF, 20%, 35 Vdcw	C41046
C14	Cap, mica, 1000pF, 5%, 500 Vdcw	C06102
C15	Cap, mica, 510pF, 5%, 500 Vdcw	C06511
	(for 1.4 MHz IF, 560pF)	(C06561)
C16	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C17	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C18	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C19	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C20	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C21	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C22	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C23	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C24	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C25	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C26	Not used	---
C27	Cap, tant, 0.1μF, 20%, 35 Vdcw	C41046
C28	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C29	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C30	Cap, mica, 270pF, 5%, 500 Vdcw	C05271
C31	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C32	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C33	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C34	Cap, mica, 680pF, 5%, 500 Vdcw	C06681
C35	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C36	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C37	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C38	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C39	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C40	Cap, cer, feedthru, 470pF, 10%	C00003
C41	Cap, cer, .0047μF, 10%, 500 Vdcw	C10047

RF AMPLIFIER & MIXER PC BD ASSY A1 (CONT.)

REF DESIG	DESCRIPTION	P/N
C42	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C43	Not used	---
C44	Cap, tant, 0.1μF, 20%, 35 Vdcw	C41046
C45	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C46	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C47	Cap, mica, 820pF, 5%, 500 Vdcw	C06821
C48	Cap, mica, 680pF, 5%, 500 Vdcw	C06681
C49	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C50	Cap, mica, 390pF, 5%, 500 Vdcw	C05391
C51	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
CR1	Diode, si, signal, 1N4148	CR4148
CR2	Diode, si, 1 Amp, 200V, 1N4003	CR4003
CR3	Diode, si, signal, 1N4148	CR4148
CR4	Diode, si, signal, 1N4148	CR4148
K1	Relay, 6 pdt, 12 Vdc	K10001
L1	Choke, rf, 0.47μH	L10R47
L2	Choke, rf, 1 mH	L10102
L3	Choke, rf, 1 mH	L10102
L4	Choke, rf, 1 mH	L10102
L5	Choke, rf, 100μH	L10101
L6	Choke, rf, 1 mH	L10102
L7	Choke, rf, 100μH	L10101
Q1	Transistor, dual gate mosfet, 40823	Q40823
Q2	Transistor, npn, 2N5179	Q51790
Q3	Transistor, dual gate mosfet, 40823	Q40823
R1	Res, comp, 560Ω, 5%, 1/4W	R20561
R2	Res, comp, 470K, 5%, 1/4W	R20474
R3	Res, comp, 56K, 5%, 1/4W	R20563
R4	Res, comp, 100K, 5%, 1/4W	R20104
R5	Res, comp, 470K, 5%, 1/4W	R20474
R6	Res, comp, 4.7K, 5%, 1/4W	R20472
R7	Res, comp, 33K, 5%, 1/4W	R20333
R8	Res, comp, 220Ω, 5%, 1/4W	R20221
R9	Res, comp, 22Ω, 5%, 1/4W	R20220
R10	Res, comp, 220Ω, 5%, 1/4W	R20221
R11	Res, comp, 6.8K, 5%, 1/4W	R20682
R12	Res, comp, 3.3K, 5%, 1/4W	R20332
R13	Res, comp, 82Ω, 5%, 1/4W	R20820
R14	Res, comp, 220Ω, 5%, 1/4W	R20221
R15	Res, comp, 33K, 5%, 1/4W	R20333
R16	Res, comp, 180K, 5%, 1/4W	R20184

RF AMPLIFIER & MIXER PC BD ASSY A1 (CONT.)

REF DESIG	DESCRIPTION	P/N
R17	Res, comp, 68K, 5%, 1/4W	R20683
R18	Res, comp, 39K, 5%, 1/4W	R20393
R19	Res, comp, 270Ω, 5%, 1/4W	R20271
R20	Res, comp, 22K, 5%, 1/4W	R20223
R21	Pot, trim, pc, 100Ω	R88101
R22	Res, comp, 1.5K, 5%, 1/4W	R20152
R23	Res, comp, 27Ω, 5%, 1/4W	R20270
R24	Res, comp, 27Ω, 5%, 1/4W	R20270
R25	Res, comp, 470Ω, 5%, 1/4W	R20471
R26	Res, comp, 1K, 5%, 1/4W	R20102
R27	Res, comp, 1K, 5%, 1/4W	R20102
R28	Res, comp, 100Ω, 5%, 1/4W	R20101
R29	Res, comp, 15K, 5%, 1/4W	R20153
R30	Res, comp, 15K, 5%, 1/4W	R20153
R31	Res, comp, 470Ω, 5%, 1/4W	R20471
R32	Res, comp, 470Ω, 5%, 1/4W	R20471
R33	Res, comp, 3.9K, 5%, 1/4W	R20392
R34	Res, comp, 2.2K, 5%, 1/4W	R20222
R35	Res, comp, 1.2K, 5%, 1/4W	R20122
R36	Res, comp, 3.9K, 5%, 1/4W	R20392
R37	Res, comp, 470Ω, 5%, 1/4W	R20471
R38	Res, comp, 180K, 5%, 1/4W	R20184
R39	Res, comp, 39K, 5%, 1/4W	R20393
R40	Not used	---
R41	Res, comp, 47K, 5%, 1/4W	R20473
R42	Res, comp, 47K, 5%, 1/4W	R20473
R43	Res, comp, 100Ω, 5%, 1/4W	R20101
R44	Res, comp, 7.5K, 5%, 1W	R40752
R45	Res, comp, 820Ω, 5%, 2W	R50821
R46	Not used	---
R47	Res, comp, 27Ω, 5%, 1/4W	R20270
R48	Res, comp, 100Ω, 5%, 1/4W	R20101
R49	Res, comp, 100Ω, 5%, 1/4W	R20101
T1	Transformer, if, 1500 kHz	T10004
T2	Transformer, if, 1500 kHz	T10004
T3	Transformer, if, 1500 kHz	T10004
T4	Transformer, 2-30 MHz, broadband	T10200
T5	Transformer, 2-30 MHz, broadband	T10200
U1	IC, modulator, MC1596G	U1596G
U2	IC, rf ampl, CA-3028A	U3028A
V1	Tube, electron, 12DZ6	V12DZ6
V2	Tube, electron, 12BY7	V12BY7

RF AMPLIFIER & MIXER PC BD ASSY A1 (CONT.)

REF DESIG	DESCRIPTION	P/N
XK1	Socket, relay	X00300
XV1	Socket, tube, 7 pin	X00200
XV2	Socket, tube, 9 pin	X00201

POWER CONTROL PC BD ASSY A2

REF DESIG	DESCRIPTION	P/N
---	POWER CONTROL PC BOARD ASSEMBLY	210370
C1	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C2	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C3	Not used	---
C4	Cap, cer, 3.3pF, 5%, np0	C00015
C5	Cap, mica, 10pF, 5%, 500 Vdcw	C05100
C6	Cap, cer, .01μF, 20%, 50 Vdcw	C10101
C7	Cap, cer, .01μF, 20%, 50 Vdcw	C10101
C8	Cap, cer, .01μF, 20%, 50 Vdcw	C10101
C9	Cap, air, var, 11-75pF	C60005
C10	Cap, cer, .01μF, 20%, 50 Vdcw	C10101
C11	Cap, tant, 33μF, 10%, 10 Vdcw	C43362
C12	Cap, tant, 33μF, 10%, 10 Vdcw	C43362
C13	Cap, cer, .01μF, 20%, 50 Vdcw	C10101
C14	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C15	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C16	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C17	Cap, tant, 22μF, 10%, 15 Vdcw	C42263
C18	Cap, cer, .01μF, 20%, 50 Vdcw	C10101
C19	Cap, tant, 33μF, 10%, 10 Vdcw	C43362
C20	Cap, mica, 150pF, 5%, 500 Vdcw	C05151
C21	Cap, tant, 10μF, 10%, 20 Vdcw	C41064
C22	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C23	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C24	Cap, cer, .01μF, 20%, 50 Vdcw	C10101
C25	Cap, cer, .01μF, 20%, 50 Vdcw	C10101
CR1	Diode, si, signal, 1N4148	CR4148
CR2	Diode, si, signal, 1N4148	CR4148
CR3	Diode, si, signal, 1N4148	CR4148
CR4	Diode, si, signal, 1N4148	CR4148
CR5	Diode, ger, signal, 1N277	CR2770
CR6	Diode, si, signal, 1N4148	CR4148
CR7	Diode, si, signal, 1N4148	CR4148
CR8	Diode, si, signal, 1N4148	CR4148
CR9	Diode, si, signal, 1N4148	CR4148
CR10	Diode, si, signal, 1N4148	CR4148
CR11	Diode, si, signal, 1N4148	CR4148
CR12	Diode, si, signal, 1N4148	CR4148
CR13	Diode, si, signal, 1N4148	CR4148
CR14	Diode, si, signal, 1N4148	CR4148
CR15	Diode, si, signal, 1N4148	CR4148
CR16	Diode, si, signal, 1N4148	CR4148
CR17	Diode, si, signal, 1N4148	CR4148
CR18	Diode, si, signal, 1N4148	CR4148
CR19	Diode, si, signal, 1N4148	CR4148

POWER CONTROL PC BD ASSY A2 (CONT.)

REF DESIG	DESCRIPTION	P/N
CR20	Diode, si, signal, 1N4148	CR4148
CR21	Diode, si, signal, 1N4148	CR4148
CR22	Diode, si, signal, 1N4148	CR4148
J1	Recept, phono, staked mtg	J00101
L1	Choke, rf, 1 mH	L10102
L2	Choke, rf, 100 μH	L10101
L3	Choke, rf, 100 μH	L10101
Q1	Transistor, pnp, 100V, MPS-L51	Q00007
Q2	Transistor, npn, 120V, MPS-L01	Q00008
Q3	Transistor, j-fet, n-chan, 2N5485	Q54850
Q4	Transistor, pnp, 2N4125	Q41250
Q5	Transistor, pnp, 2N4125	Q41250
Q6	Transistor, pnp, 2N4125	Q41250
Q7	Transistor, pnp, 2N4125	Q41250
R1	Res, comp, 5.6K, 5%, 1/2W	R30562
R2	Res, comp, 5.6K, 5%, 1/2W	R30562
R3	Res, comp, 12K, 5%, 1/2W	R30123
R4	Pot, trim, pc, 10K	R88103
R5	Res, comp, 15K, 5%, 1/2W	R30153
R6	Res, comp, 33K, 5%, 1/4W	R20333
R7	Res, comp, 1.5K, 5%, 1/4W	R20152
R8	Pot, trim, pc, min, 5K	R89502
R9	Res, comp, 10K, 5%, 1/4W	R20103
R10	Res, comp, 68K, 5%, 1/4W	R20683
R11	Res, comp, 100Ω, 5%, 1/4W	R20101
R12	Res, comp, 4.7K, 5%, 1/4W	R20472
R13	Res, comp, 82K, 5%, 1/4W	R20823
R14	Res, comp, 2.7K, 5%, 1/4W	R20272
R15	Res, comp, 82K, 5%, 1/4W	R20823
R16	Res, comp, 47K, 5%, 1/4W	R20473
R17	Res, comp, 150K, 5%, 1/4W	R20154
R18	Not used	---
R19	Res, comp, 4.7K, 5%, 1/4W	R20472
R20	Res, comp, 47K, 5%, 1/4W	R20473
R21	Res, comp, 150K, 5%, 1/4W	R20154
R22	Res, comp, 2.7K, 5%, 1/4W	R20272
R23	Res, comp, 1.5K, 5%, 1/4W	R20152
R24	Res, comp, 10K, 5%, 1/4W	R20103
R25	Res, comp, 10K, 5%, 1/4W	R20103
R26	Res, comp, 6.8K, 5%, 1/4W	R20682
R27	Res, comp, 3.3K, 5%, 1/4W	R20332
R28	Res, comp, 47K, 5%, 1/4W	R20473
R29	Res, comp, 4.7K, 5%, 1/4W	R20472

POWER CONTROL PC BD ASSY A2 (CONT.)

REF DESIG	DESCRIPTION	P/N
R30	Res, comp, 10K, 5%, 1/4W	R20103
R31	Res, comp, 470Ω, 5%, 1/4W	R20471
R32	Res, comp, 390K, 5%, 1/4W	R20394
R33	Res, comp, 39K, 5%, 1/4W	R20393
R34	Res, comp, 2.7K, 5%, 1/4W	R20272
R35	Not used	---
R36	Not used	---
R37	Res, comp, 47K, 5%, 1/4W	R20473
R38	Res, comp, 1K, 5%, 1/4W	R20102
R39	Res, comp, 6.8K, 5%, 1/4W	R20682
R40	Res, comp, 470Ω, 5%, 1/4W	R20471
R41	Res, comp, 150K, 5%, 1/4W	R20154
R42	Res, comp, 10K, 5%, 1/4W	R20103
R43	Res, comp, 560Ω, 5%, 1/4W	R20561
R44	Not used	---
R45	Res, comp, 18K, 5%, 1/4W	R20183
R46	Res, comp, 47K, 5%, 1/4W	R20473
R47	Res, comp, 15K, 5%, 1/4W	R20153
R48	Res, comp, 100K, 5%, 1/4W	R20104
R49	Res, comp, 120K, 5%, 1/4W	R20124
R50	Pot, trim, pc, min, 10K	R89103
R51	Res, comp, 22K, 5%, 1/4W	R20223
R52	Res, comp, 2.7K, 5%, 1/4W	R20472
R53	Res, comp, 68K, 5%, 1/4W	R20683
R54	Res, comp, 10K, 5%, 1/4W	R20103
R55	Res, comp, 10K, 5%, 1/4W	R20103
R56	Res, comp, 1.5 meg, 5%, 1/4W	R20105
R57	Not used	---
R58	Res, comp, 100Ω, 5%, 1/4W	R20101
U1	IC, npn transistor array, CA3086AE	U3086E
U2	IC, npn transistor array, CA3086AE	U3086E
VR1	Diode, zener, 39V, 5%, 1W, 1N4754A	VR4754
VR2	Diode, zener, 5.6V, 5%, 400 mW, 1N752A	VR7520
VR3	Diode, zener, 5.6V, 5%, 400 mW, 1N752A	VR7520

CH TUNING PCB ASSY A3-A12

REF DESIG	DESCRIPTION	P/N
---	CHANNEL TUNING PC BOARD ASSEMBLY SIMPLEX WITHOUT IMAGE TRAP (as listed below:)	
	1.6-2.5 MHz	200390-1
C3	Cap, mica, 120pF, 5%, 500 Vdcw	C05121
C4	Cap, mica, 680pF, 5%, 500 Vdcw	C06681
C5	Cap, mica, 270pF, 5%, 500 Vdcw	C05271
C7	Cap, mica, 820pF, 5%, 500 Vdcw	C06821
C8	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C9	Cap, mica, 270pF, 5%, 500 Vdcw	C05271
C11	Cap, mica, 47pF, 5%, 500 Vdcw	C05470
C12	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C13	Cap, mica, 68pF, 5%, 500 Vdcw	C05680
L2	Inductor, var, pc, 4.4-10μH	L30005
L3	Inductor, var, pc, 4.4-10μH	L30005
L4	Inductor, var, pc, 33-70μH	L31008
R2	Pot, trim, pc, min, 10K	R89103
R3	Res, comp, 2.7K, 5%, 1/4W	R20272
R4	Res, comp, 15K, 5%, 1/4W	R20153
R5	Res, comp, 6.8K, 5%, 1/4W	R20682
	2.5-3.5 MHz	200390-2
C3	Cap, mica, 100pF, 5%, 500 Vdcw	C05101
C4	Cap, mica, 620pF, 5%, 500 Vdcw	C06621
C5	Cap, mica, 100pF, 5%, 500 Vdcw	C05111
C7	Cap, mica, 680pF, 5%, 500 Vdcw	C06681
C8	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C9	Cap, mica, 180pF, 5%, 500 Vdcw	C05181
C11	Cap, mica, 33pF, 5%, 500 Vdcw	C05330
C12	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C13	Cap, mica, 39pF, 5%, 500 Vdcw	C05390
L2	Inductor, var, pc, 2.0-5.3μH	L30004
L3	Inductor, var, pc, 2.0-5.3μH	L30004
L4	Inductor, var, pc, 16.5-35μH	L31007
R2	Pot, trim, pc, min, 10K	R89103
R3	Res, comp, 2.7K, 5%, 1/4W	R20272
R4	Res, comp, 6.8K, 5%, 1/4W	R20682

CH TUNING PC BD ASSY A3-A12 (CONT.)

REF DESIG	DESCRIPTION	P/N
	3.5-5.5 MHz	200390-3
C3	Cap, mica, 68pF, 5%, 500 Vdcw	C05680
C4	Cap, mica, 330pF, 5%, 500 Vdcw	C05331
C5	Cap, mica, 68pF, 5%, 500 Vdcw	C05680
C7	Cap, mica, 390pF, 5%, 500 Vdcw	C05391
C8	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C9	Cap, mica, 100pF, 5%, 500 Vdcw	C05101
C11	Cap, mica, 27pF, 5%, 500 Vdcw	C05270
C12	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C13	Cap, mica, 51pF, 5%, 500 Vdcw	C05510
L2	Inductor, var, pc, 2.0-5.3μH	L30004
L3	Inductor, var, pc, 2.0-5.3μH	L30004
L4	Inductor, var, pc, 7.5-17μH	L31006
R2	Pot, trim, pc, min, 10K	R89103
R3	Res, comp, 2.7K, 5%, 1/4W	R20272
R5	Res, comp, 6.8K, 5%, 1/4W	R20682
	5.5-8.0 MHz	200390-4
C3	Cap, mica, 30pF, 5%, 500 Vdcw	C05300
C4	Cap, mica, 120pF, 5%, 500 Vdcw	C05121
C5	Cap, mica, 39pF, 5%, 500 Vdcw	C05390
C7	Cap, mica, 150pF, 5%, 500 Vdcw	C05151
C8	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C9	Cap, mica, 39pF, 5%, 500 Vdcw	C05390
C11	Cap, mica, 30pF, 5%, 500 Vdcw	C05300
C12	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C13	Cap, mica, 30pF, 5%, 500 Vdcw	C05300
L2	Inductor, var, pc, 2.0-5.3μH	L30004
L3	Inductor, var, pc, 2.0-5.3μH	L30004
L4	Inductor, var, pc, 3.5-8.5μH	L31005
R2	Pot, trim, pc, min, 10K	R89103
R3	Res, comp, 2.7K, 5%, 1/4W	R20272
R4	Res, comp, 22K, 5%, 1/4W	R20223
R5	Res, comp, 6.8K, 5%, 1/4W	R20682

CH TUNING PC BD ASSY A3-A12 (CONT.)

REF DESIG	DESCRIPTION	P/N
	8.0-12.0 MHz	200390-5
C3	Cap, mica, 30pF, 5%, 500 Vdcw	C05300
C4	Cap, mica, 130pF, 5%, 500 Vdcw	C05131
C5	Cap, mica, 33pF, 5%, 500 Vdcw	C05330
C7	Cap, mica, 120pF, 5%, 500 Vdcw	C05121
C8	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C9	Cap, mica, 39pF, 5%, 500 Vdcw	C05390
C11	Cap, mica, 12pF, 5%, 500 Vdcw	C05120
C12	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C13	Cap, mica, 39pF, 5%, 500 Vdcw	C05390
L2	Inductor, var, pc, 0.9-2.3μH	L30003
L3	Inductor, var, pc, 0.9-2.3μH	L30003
L4	Inductor, var, pc, 1.7-3.9μH	L31004
R1	Res, comp, 15K, 5%, 1/4W	R20153
R2	Pot, trim, pc, min, 10K	R89103
R3	Res, comp, 2.7K, 5%, 1/4W	R20272
R4	Res, comp, 10K, 5%, 1/4W	R20103
R5	Res, comp, 10K, 5%, 1/4W	R20103
	12.0-18.0 MHz	200390-6
C3	Cap, mica, 15pF, 5%, 500 Vdcw	C05150
C4	Cap, mica, 30pF, 5%, 500 Vdcw	C05300
C5	Cap, mica, 33pF, 5%, 500 Vdcw	C05330
C7	Cap, mica, 22pF, 5%, 500 Vdcw	C05220
C8	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C9	Cap, mica, 33pF, 5%, 500 Vdcw	C05330
C12	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C13	Cap, mica, 39pF, 5%, 500 Vdcw	C05390
L2	Inductor, var, pc, 0.9-2.3μH	L30003
L3	Inductor, var, pc, 0.9-2.3μH	L30003
L4	Inductor, var, pc, 0.9-2.1μH	L31003
R2	Pot, trim, pc, min, 10K	R89103
R3	Res, comp, 2.7K, 5%, 1/4W	R20272
R4	Res, comp, 22K, 5%, 1/4W	R20223

TABLE 9-1. ACC CIRCUIT VOLTAGE INDICATIONS (Power Control PC Board Assy A3A2)

Test conditions unless otherwise noted:

a. Transmit AM or PCS (Reduced Carrier) Mode only.
b. Reduced power potentiometer R8 and average current limit potentiometer R50 set to minumum.
c. Levels correspond to approx. 13 Vrms output from pa on PCS, 43 Vrms on AM carrier, 88 Vrms with modulation.
d. Measurements indicated are typical, but actual units may vary widely.

TEST POINT	PCS & AM (No Mod)	AM & 1KHZ MOD	SSB (No Mod)
Q3 Drain	+12 Vdc	+12 Vdc	+12 Vdc
Q3 Gate	+1.6 Vdc	+1.6 Vdc	+1.6 Vdc
Q3 Source	+2 Vdc	+2 Vdc	+2 Vdc
U1 Pins 10 & 6	+1.5 Vdc	+1.5 Vdc	+1.5 Vdc
U1 Pin 7	+2.5V	4V 1V 0V	+0.7 Vdc
U1 Pin 4	+2.5 Vdc	+2.5 Vdc	+0.7 Vdc
U1 Pin 3	+2 Vdc	+2 Vdc	+1.2 Vdc
U1 Pin 5	+9.4 Vdc	+9.4 Vdc	+12 Vdc
Q4 Emitter	+10.1 Vdc	+10.1 Vdc	+12.0 Vdc
Q4 Collector	+0.7 Vdc	+0.7 Vdc	0 Vdc

TABLE 9-1. ACC CIRCUIT VOLTAGE INDICATIONS (Power Control PC Board Assy A3A2)

Test conditions unless otherwise noted:

a. Transmit AM or PCS (Reduced Carrier) Mode only.
b. Reduced power potentiometer R8 and average current limit potentiometer R50 set to minumum.
c. Levels correspond to approx. 13 Vrms output from pa on PCS, 43 Vrms on AM carrier, 88 Vrms with modulation.
d. Measurements indicated are typical, but actual units may vary widely.

TEST POINT	PCS & AM (No Mod)	AM & 1KHZ MOD	SSB (No Mod)
Q3 Drain	+12 Vdc	+12 Vdc	+12 Vdc
Q3 Gate	+1.6 Vdc	+1.6 Vdc	+1.6 Vdc
Q3 Source	+2 Vdc	+2 Vdc	+2 Vdc
U1 Pins 10 & 6	+1.5 Vdc	+1.5 Vdc	+1.5 Vdc
U1 Pin 7	+2.5V	4V 1V 0V	+0.7 Vdc
U1 Pin 4	+2.5 Vdc	+2.5 Vdc	+0.7 Vdc
U1 Pin 3	+2 Vdc	+2 Vdc	+1.2 Vdc
U1 Pin 5	+9.4 Vdc	+9.4 Vdc	+12 Vdc
Q4 Emitter	+10.1 Vdc	+10.1 Vdc	+12.0 Vdc
Q4 Collector	+0.7 Vdc	+0.7 Vdc	0 Vdc

TABLE 9-2. PPC CIRCUIT VOLTAGE INDICATIONS (Power Control PC Board Assy A3A2)

Test conditions unless otherwise noted:

a. Transmit USB or LSB mode, audio applied.
b. Two-tone measurements depend on level of applied audio and setting of TRANSMIT AUDIO control on front panel.
c. Single-tone measurements based on R50 setting for full scale front panel meter limiting and full audio drive.
d. Measurements indicated are typical, but actual units may vary widely.

TEST POINT	SSB, No Mod	SSB, 2-TONE	SSB, 1-TONE
Q5 Base	11.4 Vdc	11.4 Vdc	
Q5 Emitter	11.4 Vdc	11.4 Vdc	
Q5 Collector	0	+1.5 Vdc 5V	
U2 Pin 7	0	4.5V 2.4V 0	
U2 Pin 9	0	+2.4 Vdc	
U2 Pin 10	0	+1.7 Vdc	
E8	0	+0.7 Vdc	
U2 Pin 1	+11.4 Vdc		+10.5 Vdc
U2 Pin 2	+1.9 Vdc		+2.1 Vdc
U2 Pin 3	+1.5 Vdc		+1.5 Vdc
U2 Pin 4	+2.2 Vdc		+2.1 Vdc
U2 Pin 5	+11.4 Vdc		+11.4 Vdc

TABLE 9-3. REDUCED POWER CIRCUIT VOLTAGE INDICATIONS (Power Control PPC Board Assy A3A2)

Test conditions unless otherwise noted:

a. AM mode, no modulation, transmit.
b. Measurements indicated are typical, but actual units may vary widely.

TEST POINT	R8 FULLY CCW	R8 FULLY CW
Junction CR1 & R9	-0.3 Vdc	+4.6 Vdc
Q1 Base	-0.4 Vdc	-0.18 Vdc
Q1 Collector	-2 Vdc	-40 Vdc
Q1 Emitter	+0.25 Vdc	+0.4 Vdc
Q2 Base	-2 Vdc	-40 Vdc
Q2 Emitter	-2 Vdc	-40 Vdc
Q2 Collector	+12 Vdc	+12 Vdc

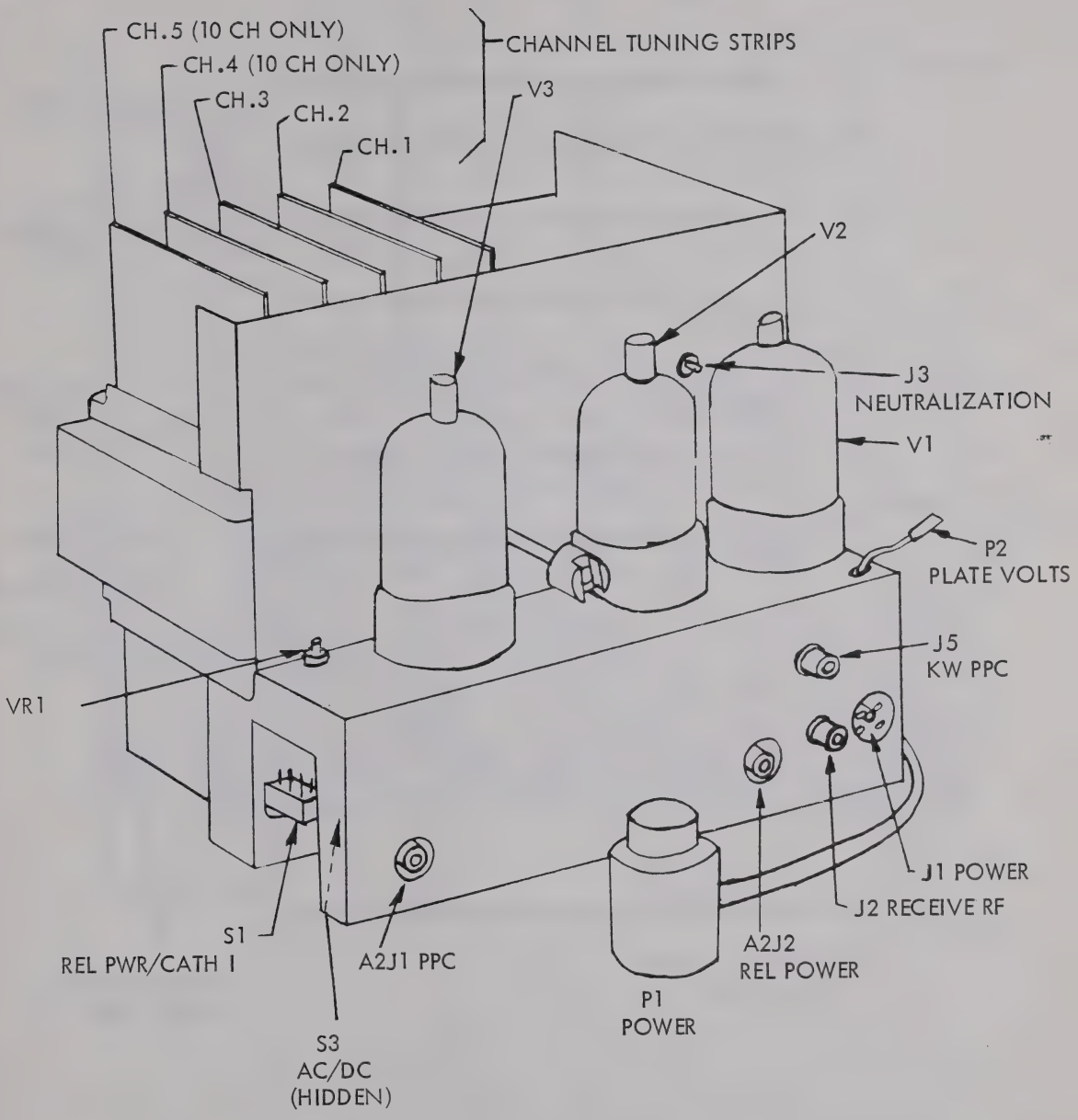


Figure 9-1. RF Amplifier Module Assembly, Rear View

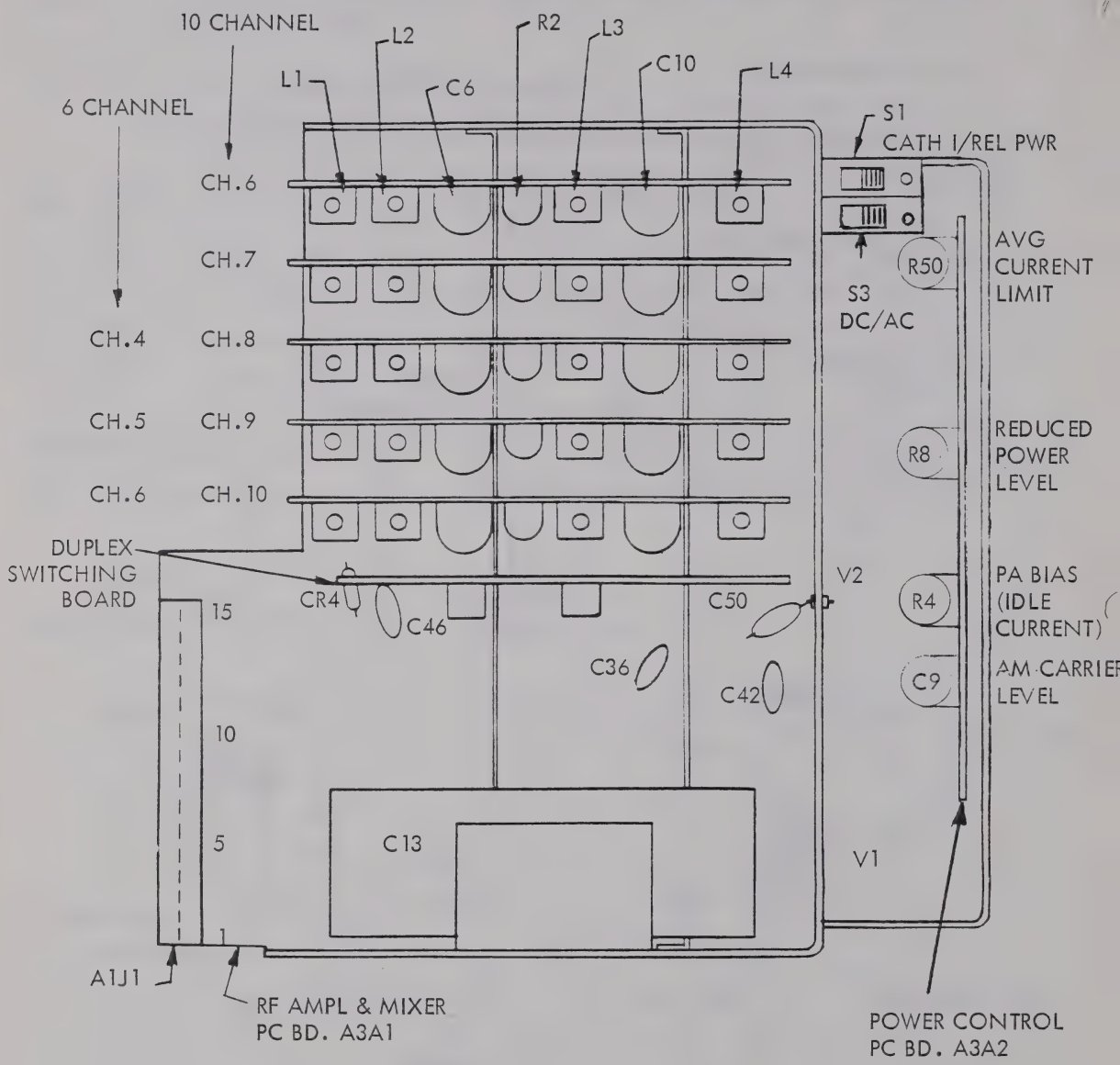


Figure 9-2. RF Amplifier Module Assembly, Bottom View

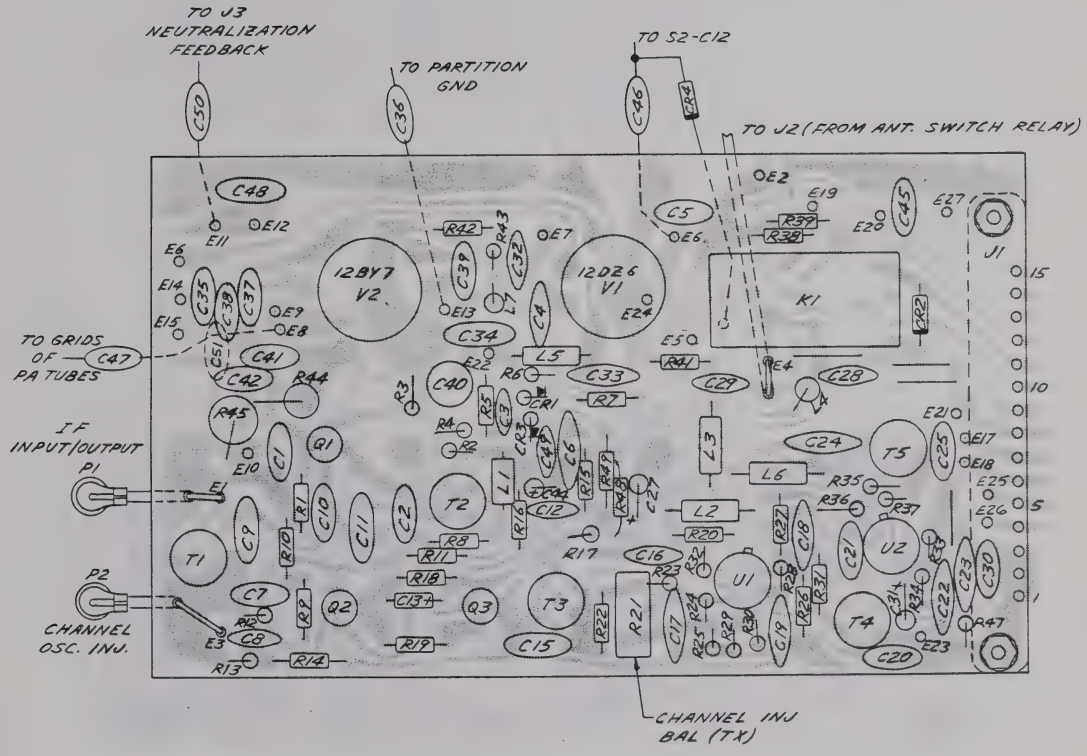


Figure 9-3. RF Amplifier Mixer PC Board Assembly A3A1

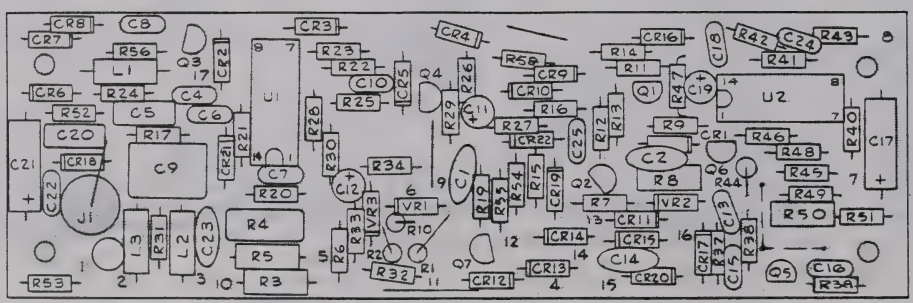
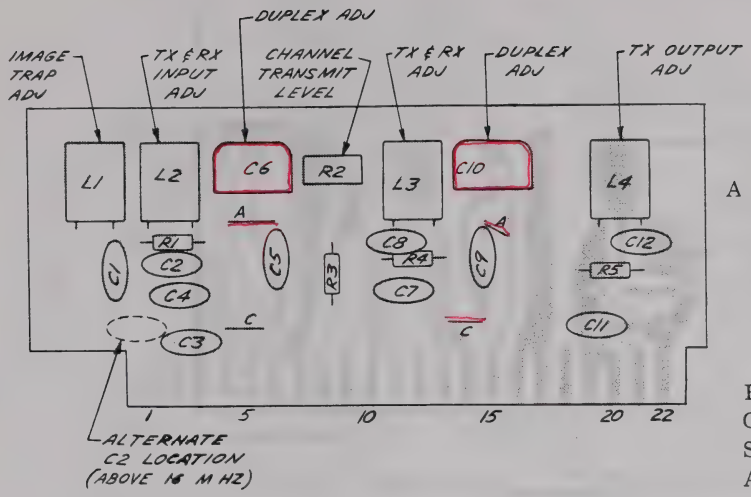
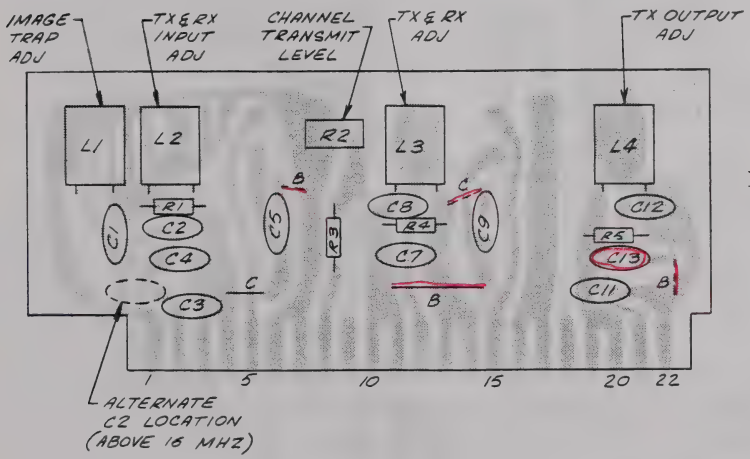


Figure 9-4. Power Control PC Board Assembly A3A2



Duplex
A - ~~SIMPLEX~~

Figure 9-5. Channel Tune Strips A3A3-A3A12.



simplex
B - ~~DUPLEX~~

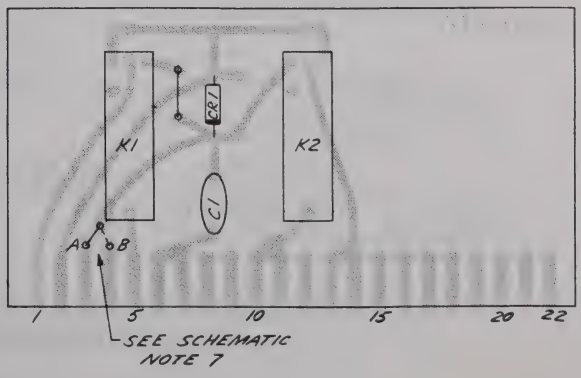


Figure 9-6. Duplex Switching Board A3A13

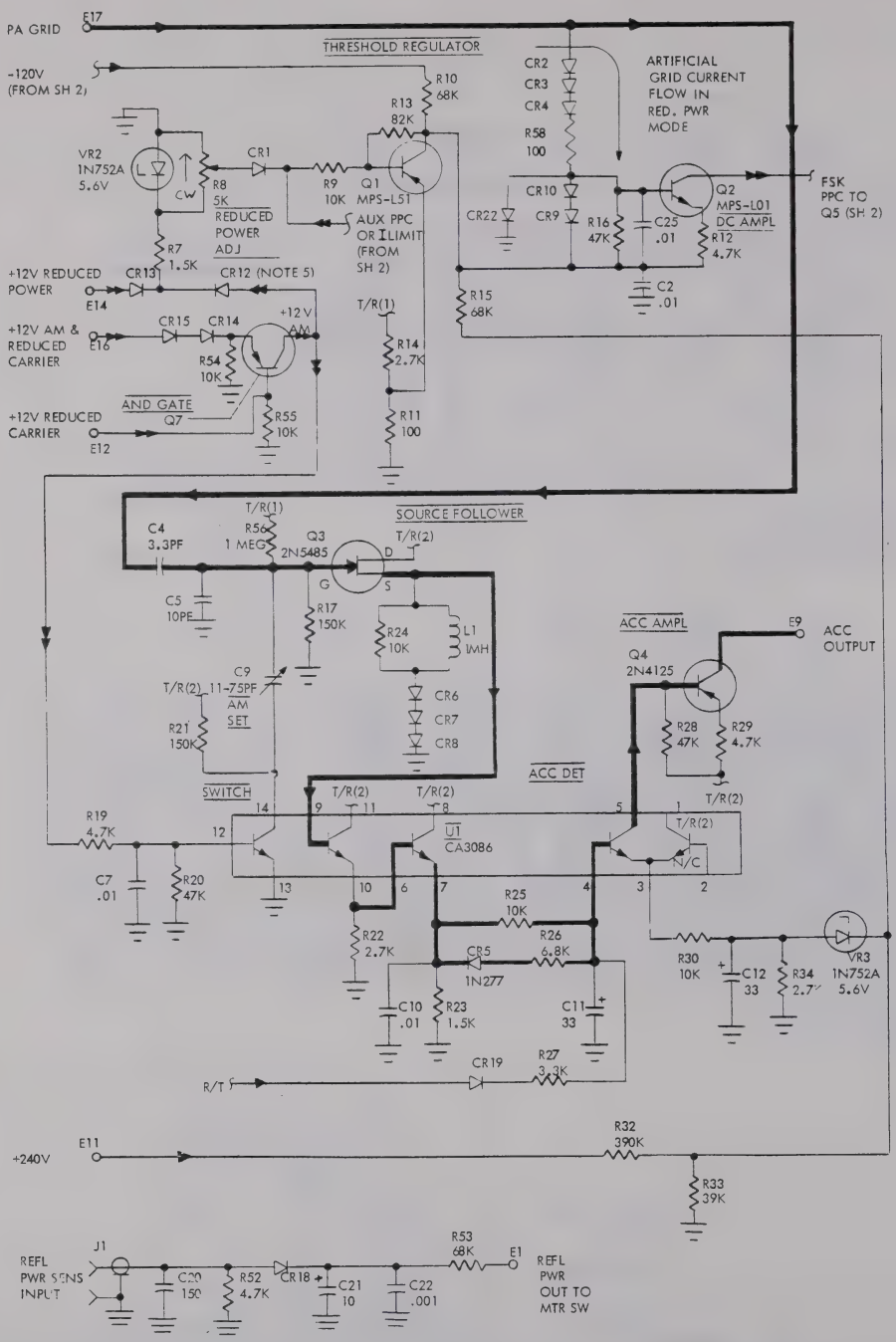
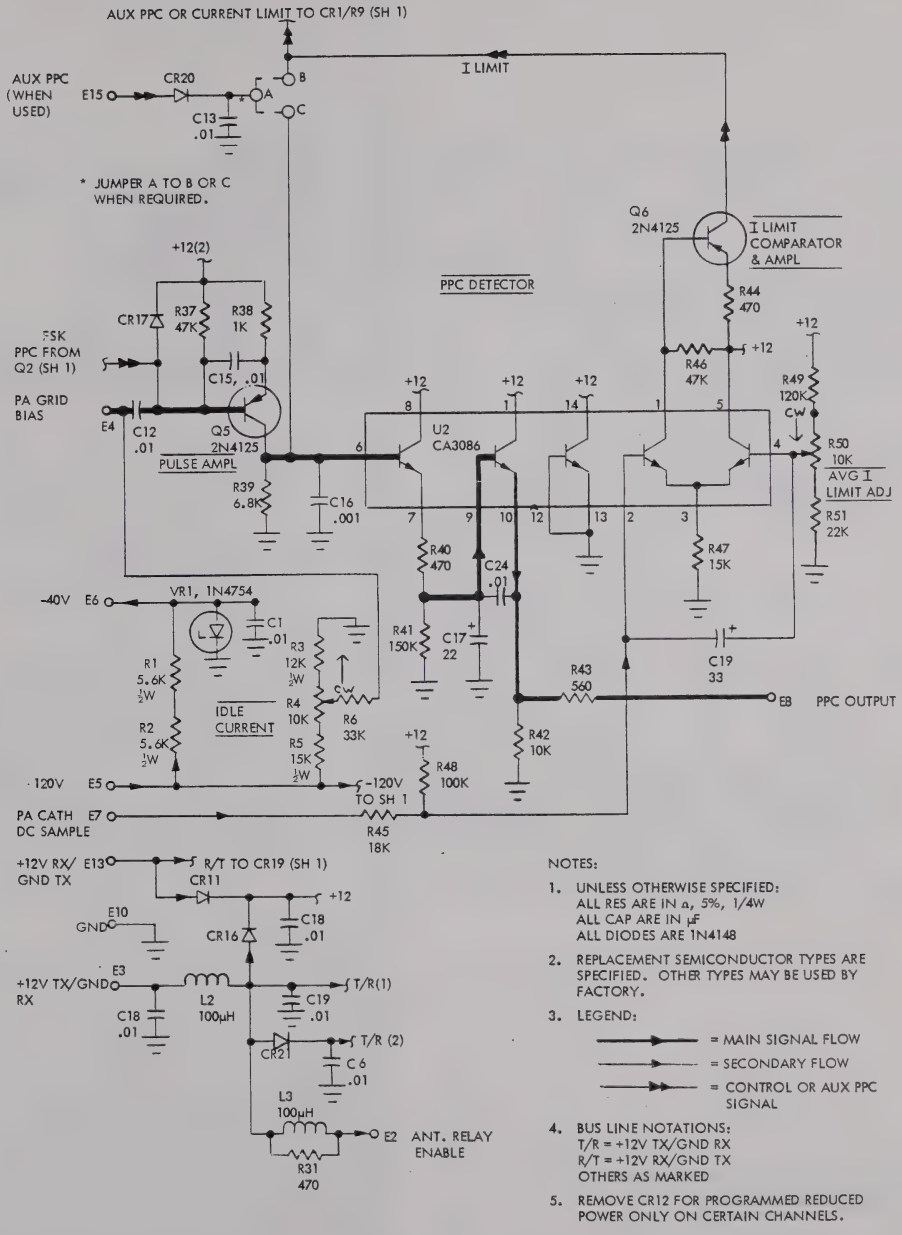


Figure 9-7. Power Control (ACC/PPC) Board Assy A3A2, Schematic Diagram (Sheet 1 of 2)



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   ALL RES ARE IN Ω, 5%, 1/4W
   ALL CAP ARE IN µF
   ALL DIODES ARE 1N4148
2. REPLACEMENT SEMICONDUCTOR TYPES ARE SPECIFIED. OTHER TYPES MAY BE USED BY FACTORY.
3. LEGEND:
   - = MAIN SIGNAL FLOW
   - = SECONDARY FLOW
   - = CONTROL OR AUX PPC SIGNAL
4. BUS LINE NOTATIONS:
   T/R = +12V TX/GND RX
   R/T = +12V RX/GND TX
   OTHERS AS MARKED
5. REMOVE CR12 FOR PROGRAMMED REDUCED POWER ONLY ON CERTAIN CHANNELS.

Figure 9-7. Power Control (ACC/PPC) Board Assy A3A2, Schematic Diagram (Sheet 2 of 2)

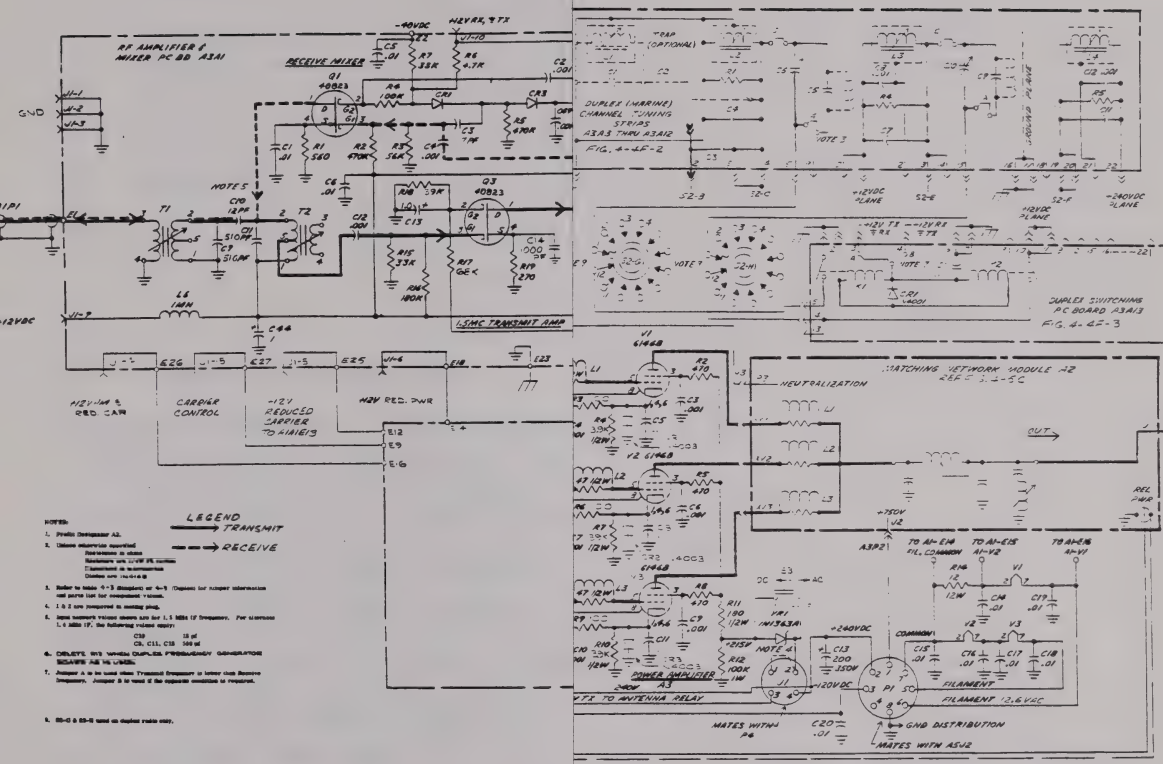


Figure 9-8. RF Amplifier Assembly A3, Schematic Diagram

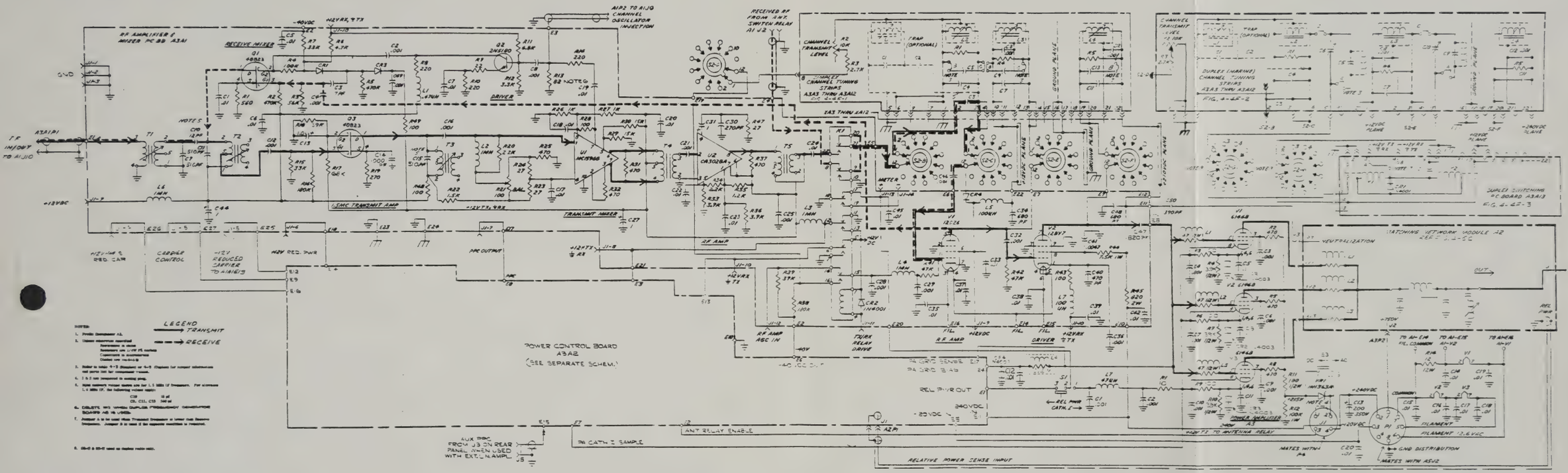


Figure 9-8. RF Amplifier Assembly A3, Schematic Diagram

CHAPTER 10
IF/AUDIO ASSEMBLY A4

TABLE OF CONTENTS

Paragraph 10.1	Theory of Operation
Paragraph 10.2	Optional Noise Limiter A4A1
----------	Parts List
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Figure 10-1	Noise Limiter Assy A4A1 Schematic
Figure 10-2	IF/Audio Board Assy View
Figure 10-3	IF/Audio Board Assy Schematic

10.1 THEORY OF OPERATION.

The IF/Audio Module A4, shown schematically in Figure 10-3 and pictorially in Figure 10-2, provides input and output signal processing from audio to the 1.5 MHz or alternate 1.4 MHz intermediate IF frequency. In transmit it accepts a 0 dBm, reduced to 100 mV by Transmit Audio level control, audio signal and converts it to a IF signal at -48 dBm. In receive it accepts a nominal 250 μV IF signal and converts it to a 0 dBm audio signal. Refer to Figure 10-3 for the following discussion.

Transmit. - Audio and carrier from the frequency generator board are mixed in U5, the transmit balanced modulator. T7 provides selective tuning and matching to the ssb filter input FL1. FL1 is nominally a 2.9 kHz mechanical filter. A 2.1 kHz filter is available as an option. This filter provides nominal opposite sideband rejection of 50 dB. After filtering the 455 kHz sideband signal is up converted to 1.5 MHz or alternate 1.4 MHz by bi-directional double balanced mixer T1, T2, CR1-CR4. Output is nominally -48 dBm to the RF Amplifier module. Transmit peak power control (PPC) is applied to Q1 to maintain output power at 150 Watts p.e.p. As a safety feature, power amplifier cathode current is also sensed and added to PPC to provide average control (APC) as a threshold type power compression. In this fashion the power amplifier is protected against both over voltage and over current. R1 controls the level of PPC compression.

For the AM and reduced carrier mode of transmission, Q29 acts as a gain control element controlling the carrier reinsertion to the second mixer input. Drive signal is obtained from the RF Amplifier Module (A3).

Q2 is the second LO injection buffer amplifier. It provides the drive necessary for the 1.5 MHz mixer. R3 sets the injection level.

No additional stages on the IF/Audio board are required for signal processing. The receive IF which bridges the transmit modulator, is placed in full AGC compression while in transmit.

Additional transmit functions are performed by Q24-Q27. Q24 provides for carrier reinsertion upon grounding of the ANTENNA/AM TUNE line. This line, available at a remote antenna coupler, provides for tune power, approximately 32 Watts, for antenna coupler alignment. Q25, C75, and R119 provide a 500 mS transmit to receive delay when the keyline is open. This may be reduced by removal of C75. Q26 is an inverter and Q27 the TR relay driver. The keyline inhibit line grounds the base of Q27 and prevents the transmitter from becoming energized when, in OFF, STANDBY, or RECEIVE and when the Antenna Coupler is tuning.

When in receive, the IF signal from the RF Amplifier is applied to bi-directional double balanced mixer T1, T2, CR1-CR4. A receive filter is selected, depending on mode, by Q3-Q7. Filter cutoff is accomplished by shunting, with the filter being cut off grounded at both the input and output. The am filter normally supplied is a double tuned circuit T8, T9. A mechanical 6 kHz am filter is available as an option.

The filter output is applied to IF amplifiers U1 and U2. This if output drives U3, the ssb product detector and am third if amplifier and U4, the agc if amplifier. At maximum gain (below agc threshold), if to audio gain is approximately 75 dB. In ssb product detector injection is supplied by carrier gate Q14. In am, injection is removed by disabling the oscillator in the frequency generator module A6. U3 output is buffered by Q17-Q18 which in conjunction with C67 provides envelope am detection. In ssb, Q19 shunts rf products out by grounding C66. Audio amplifier Q20-Q23 provides the necessary output for delivering a 0 dB line output and speaker amplifier driving power.

AGC amplifier U4 drives both agc detector CR12, CR11, C41, and agc dump detector Q13, C43. The purpose of the second agc detector is to allow a dual agc decay time constant. Upon removal of an input signal C41 discharges through R58. The time constant is several seconds. However, when the second detector agc voltage across C43, whose decay is faster but amplitude larger, falls below the reference set by R60 and R62, Q11 fires and C41 now decays to zero in approximately 200 mS. This in effect gives an agc time constant of five seconds but lasting for only 1.2 seconds and prevents the agc voltage, in ssb, from following the syllabic rate. Q8, the front end agc amplifier, supplies agc voltage to A3A1V1 and the S meter for signal strength indication.

10.2 OPTIONAL NOISE LIMITER BOARD A4A1.

The function of the noise limiter, located on the IF/Audio Module A4, is to prevent noise pulses from de-sensitizing the transceiver and to reduce undesirable noise from the receiver audio outputs. Refer to schematic diagram, Figure 10-1.

CR1 and CR2 detect negative and positive signals respectively and through C1R1 and C2R2 time constants generated dc voltage on C1 and C2 proportional to the average input signal. Noise pulses, both positive and negative, are therefore clipped by CR2 and CR1 relative to the average signal. Since noise pulses come in many variations of amplitude, frequency, and duration, a variable time constant is necessary to provide effective limiting over all operation conditions. FET Q1 provides the variable resistance required by front panel control R6. In the maximum ccw position the Noise Limiter is disabled. Maximum limiting occurs at the cw position. The limiting threshold is established by R127 on the IF/Audio Board.

IF/AUDIO PC BD ASSY

REF DESIG	DESCRIPTION	P/N
---	IF/AUDIO PC BOARD ASSEMBLY	200800
A4A1	Noise Limiter PC Board Assembly	200880
C1	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C2	Cap, mica, 470pF, 5%, 500 Vdcw	C06471
C3	Cap, mica, ___pF, 5%, 500 Vdcw	
	(for 1.5 MHz IF: 300pF)	C05301
	(for 1.4 MHz IF: 330pF)	C05331
C4	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C5	Cap, mica, ___pF, 5%, 500 Vdcw	
	(with 3.0 kHz filter: 130pF)	C05131
	(with 2.1 kHz filter: 390pF)	C05391
C6	Cap, mica, 2000pF, 5%, 500 Vdcw	C06202
C7	Cap, mica, ___pF, 5%, 500 Vdcw	
	(with LC AM filter: 130pF)	C05131
	(with ceramic AM filter: 560pF)	C06561
C8	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C9	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C10	Cap, tant, 10μF, 10%, 20 Vdcw	C41064
C11	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C12	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C13	Cap, mica, ___pF, 5%, 500 Vdcw	
	(with 3.0 kHz filter: 130pF)	C05131
	(with 2.1 kHz filter: 390pF)	C05391
C14	Cap, mica, ___pF, 5%, 500 Vdcw	
	(with LC AM filter: 130pF)	C05131
	(with ceramic AM filter: 390pF)	C05391
C15	Cap, mica, 2000pF, 5%, 500 Vdcw	C06202
C16	Cap, mica, 470pF, 5%, 500 Vdcw	C06471
C17	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C18	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C19	Cap, mica, 820pF, 5%, 500 Vdcw	C06821
	(delete when cer fltr is used (FL2))	
C20	Cap, mica, 10pF, 5%, 500 Vdcw	C05100
	(delete when cer fltr is used (FL2))	
C21	Cap, mica, 820pF, 5%, 500 Vdcw	C06821
	(delete when cer fltr is used (FL2))	
C22	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C23	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C24	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C25	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C26	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C27	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C28	Cap, tant, 22μF, 10%, 15 Vdcw	C42263
C29	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000

IF/AUDIO PC BD ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
C30	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C31	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C32	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C33	Cap, tant, 22μF, 10%, 15 Vdcw	C42263
C34	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C35	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C36	Cap, tant, 22μF, 10%, 15 Vdcw	C42263
C37	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C38	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C39	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C40	Cap, mica, 1000pF, 5%, 500 Vdcw	C06102
C41	Cap, tant, 22μF, 10%, 15 Vdcw	C42263
C42	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C43	Cap, tant, 10μF, 10%, 20 Vdcw	C41064
C44	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C45	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C46	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C47	Cap, mica, 1000pF, 5%, 500 Vdcw	C06102
C48	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C49	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C50	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C51	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C52	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C53	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C54	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C55	Cap, mica, 1000pF, 5%, 500 Vdcw	C06102
C56	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C57	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C58	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C59	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C60	Cap, mica, 1000pF, 5%, 500 Vdcw	C06102
C61	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C62	Cap, tant, 10μF, 10%, 20 Vdcw	C41064
C63	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C64	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C65	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C66	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C67	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C68	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C69	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C70	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C71	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C72	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C73	Cap, tant, 10μF, 10%, 20 Vdcw	C41064
C74	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C75	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056

IF/AUDIO PC BD ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
C76	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C77	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C78	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C79	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C80	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C81	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C82	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C83	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C84	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C85	Cap, mica, ___pF, 5%, 500 Vdcw	
	(for 1.4 MHz IF: 820pF)	C06821
	(for 1.5 MHz IF: 680pF)	C06681
C86	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C87	Cap, mica, 82pF, 5%, 500 Vdcw	C05820
C88	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
CR1	Diode, si, signal, 1N4148	CR4148
CR2	Diode, si, signal, 1N4148	CR4148
CR3	Diode, si, signal, 1N4148	CR4148
CR4	Diode, si, signal, 1N4148	CR4148
CR5-CR6	Not used	---
CR7	Diode, si, signal, 1N4148	CR4148
CR8	Diode, si, signal, 1N4148	CR4148
CR9	Diode, si, signal, 1N4148	CR4148
CR10	Diode, si, signal, 1N4148	CR4148
CR11	Diode, si, signal, 1N4148	CR4148
CR12	Not used	---
CR13	Diode, si, signal, 1N4148	CR4148
CR14	Diode, si, signal, 1N4148	CR4148
CR15	Diode, si, signal, 1N4148	CR4148
CR16	Diode, si, signal, 1N4148	CR4148
CR17	Diode, si, signal, 1N4148	CR4148
CR18	Diode, si, signal, 1N4148	CR4148
CR19	Diode, si, signal, 1N4148	CR4148
CR20	Diode, si, signal, 1N4148	CR4148
CR21	Diode, si, signal, 1N4148	CR4148
CR22	Diode, si, signal, 1N4148	CR4148
CR23	Diode, si, signal, 1N4148	CR4148
CR24	Diode, si, signal, 1N4148	CR4148
CR25	Diode, si, signal, 1N4148	CR4148
CR26	Diode, si, signal, 1N4148	CR4148
CR27	Diode, si, signal, 1N4148	CR4148
CR28	Diode, si, signal, 1N4148	CR4148
CR29	Diode, si, signal, 1N4148	CR4148
CR30	Diode, si, signal, 1N4148	CR4148
CR31	Diode, si, signal, 1N4148	CR4148
CR32	Diode, si, signal, 1N4148	CR4148

IF/AUDIO PC BD ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
CR33	Diode, si, signal, 1N4148	CR4148
CR34	Diode, si, signal, 1N4148	CR4148
FL1	Filter, mechanical, as listed below:	
	3 kHz, ssb	FL1002
	2.1 kHz, usb	FL1007
FL2	Filter, mechanical, as listed below:	
	8 kHz, am (option item)	FL1003
	6 kHz, am (option item)	FL1008
L1	Choke, rf, 51μH	L10510
L2	Choke, rf, 51μH	L10510
L3	Choke, rf, 750μH	L10751
L4	Choke, rf, 750μH	L10751
L5	Choke, rf, 51μH	L10510
L6	Not used	---
L7	Choke, rf, 750μH	L10751
L8	Choke, rf, 750μH	L10751
L9	Choke, rf, 750μH	L10751
L10	Choke, rf, 750μH	L10751
L11	Choke, rf, 390μH (use only with cer fltr (FL2))	L10391
L12	Choke, rf, 330μH (use only with cer fltr (FL2))	L10331
Q1	Transistor, npn, 2N4123	Q41230
Q2	Transistor, npn, 2N5179	Q51790
Q3	Transistor, npn, 2N4123	Q41230
Q4	Transistor, npn, 2N4123	Q41230
Q5	Transistor, npn, 2N4123	Q41230
Q6	Transistor, npn, 2N4123	Q41230
Q7	Transistor, npn, 2N4123	Q41230
Q8	Transistor, pnp, 50V, 2N5086	Q50860
Q9	Transistor, npn, 2N4123	Q41230
Q10	Transistor, npn, 2N4123	Q41230
Q11	Transistor, npn, 2N4123	Q41230
Q12	Transistor, pnp, 2N4125	Q41250
Q13	Transistor, npn, 2N4123	Q41230
Q14	Transistor, npn, 2N4123	Q41230
Q15	Transistor, npn, 2N4123	Q41230
Q16	Transistor, npn, 2N4123	Q41230
Q17	Transistor, npn, 2N4123	Q41230
Q18	Transistor, npn, 2N4123	Q41230
Q19	Transistor, npn, 2N4123	Q41230
Q20	Transistor, npn, 2N4123	Q41230
Q21	Transistor, pnp, 2N4125	Q41250
Q22	Transistor, npn, 2N4123	Q41230

IF/AUDIO PC BD ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
Q23	Transistor, pnp, 2N4125	Q41250
Q24	Transistor, pnp, 2N4125	Q41250
Q25	Transistor, pnp, 2N4125	Q41250
Q26	Transistor, npn, 2N4123	Q41230
Q27	Transistor, npn, 2N4400	Q44000
Q28	Transistor, npn, 2N4123	Q41230
Q29	Transistor, npn, 2N4123	Q41230
Q30	Transistor, npn, 2N4123	Q41230
R1	Res, comp, 2.2K, 5%, 1/4W	R20222
R2	Res, comp, 100Ω, 5%, 1/4W	R20101
R3	Pot, trim, pc, 100Ω	R88101
R4	Res, comp, 10K, 5%, 1/4W	R20103
R5	Res, comp, 1.5K, 5%, 1/4W	R20152
R6	Res, comp, 100Ω, 5%, 1/4W	R20101
R7	Res, comp, 100Ω, 5%, 1/4W	R20101
R8	Res, comp, 1.8K, 5%, 1/4W	R20182
R9	Res, comp, 10K, 5%, 1/4W	R20103
R10	Res, comp, 4.7K, 5%, 1/4W	R20472
R11	Res, comp, 10K, 5%, 1/4W	R20103
R12	Res, comp, 47K, 5%, 1/4W	R20473
R13	Res, comp, 47K, 5%, 1/4W	R20473
R14	Res, comp, 4.7K, 5%, 1/4W	R20472
R15	Res, comp, 10Ω, 5%, 1/4W	R20100
R16	Res, comp, 10K, 5%, 1/4W	R20103
R17	Res, comp, 33K, 5%, 1/4W	R20333
R18	Res, comp, 10K, 5%, 1/4W	R20103
R19	Res, comp, 3.3K, 5%, 1/4W	R20332
R20	Res, comp, 47K, 5%, 1/4W (delete when FL2 is a cer fltr)	R20473
R21	Res, comp, 47K, 5%, 1/4W (delete when FL2 is a cer fltr)	R20473
R22	Res, comp, 100Ω, 5%, 1/4W	R20101
R23	Res, comp, 47K, 5%, 1/4W	R20473
R24	Res, comp, 47K, 5%, 1/4W	R20473
R25	Res, comp, 4.7K, 5%, 1/4W	R20472
R26	Pot, trim, pc, 10K	R88103
R27	Res, comp, 2.7K, 5%, 1/4W	R20272
R28	Res, comp, 1K, 5%, 1/4W	R20102
R29	Not used	---
R30	Res, comp, 4.7K, 5%, 1/4W	R20472
R31	Res, comp, 82Ω, 5%, 1/4W	R20820
R32	Pot, trim, pc, 100Ω	R88101
R33	Not used	---
R34	Res, comp, 100Ω, 5%, 1/4W	R20101
R35	Pot, trim, pc, min, 10K	R89103
R36	Res, comp, 3.3K, 5%, 1/4W	R20332

IF/AUDIO PC BD ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
R37	Res, comp, 27Ω, 5%, 1/4W	R20270
R38	Res, comp, 56Ω, 5%, 1/4W	R20560
R39	Res, comp, 10Ω, 5%, 1/4W	R20100
R40	Res, comp, 1K, 5%, 1/4W	R20102
R41	Res, comp, 4.7K, 5%, 1/4W	R20472
R42	Res, comp, 100K, 5%, 1/4W	R20104
R43	Res, comp, 2.7K, 5%, 1/4W	R20272
R44	Res, comp, 1K, 5%, 1/4W	R20102
R45	Res, comp, 4.7K, 5%, 1/4W	R20472
R46	Res, comp, 8.2K, 5%, 1/4W	R20822
R47	Res, comp, 560Ω, 5%, 1/4W	R20561
R48	Res, comp, 4.7K, 5%, 1/4W	R20472
R49	Res, comp, 470Ω, 5%, 1/4W	R20471
R50	Res, comp, 1K, 5%, 1/4W	R20102
R51	Res, comp, 2.7K, 5%, 1/4W	R20272
R52	Res, comp, 82Ω, 5%, 1/4W	R20820
R53	Res, comp, 2.7K, 5%, 1/4W	R20272
R54	Res, comp, 27Ω, 5%, 1/4W	R20270
R55	Pot, trim, pc, min, 5K	R89502
R56	Res, comp, 2.2K, 5%, 1/4W	R20222
R57	Res, comp, 10K, 5%, 1/4W	R20103
R58	Res, comp, 470K, 5%, 1/4W	R20474
R59	Res, comp, 47K, 5%, 1/4W	R20473
R60	Res, comp, 10K, 5%, 1/4W	R20103
R61	Res, comp, 15K, 5%, 1/4W	R20153
R62	Res, comp, 2.2K, 5%, 1/4W	R20222
R63	Res, comp, 220K, 5%, 1/4W	R20224
R64	Pot, trim, pc, 5K	R88502
R65	Res, comp, 560Ω, 5%, 1/4W	R20561
R66	Not used	---
R67	Res, comp, 10K, 5%, 1/4W	R20103
R68	Res, comp, 8.2K, 5%, 1/4W	R20822
R69	Res, comp, 2.7K, 5%, 1/4W	R20272
R70	Res, comp, 4.7K, 5%, 1/4W	R20472
R71	Res, comp, 1K, 5%, 1/4W	R20102
R72	Res, comp, 1.8K, 5%, 1/4W	R20182
R73	Res, comp, 6.8K, 5%, 1/4W	R20682
R74	Res, comp, 560Ω, 5%, 1/4W	R20561
R75	Res, comp, 120K, 5%, 1/4W	R20124
R76	Res, comp, 4.7K, 5%, 1/4W	R20472
R77	Res, comp, 6.8K, 5%, 1/4W	R20682
R78	Res, comp, 1.2K, 5%, 1/4W	R20122
R79	Res, comp, 560Ω, 5%, 1/4W	R20561
R80	Res, comp, 220Ω, 5%, 1/4W	R20221
R81	Res, comp, 150Ω, 5%, 1/4W	R20151
R82	Res, comp, 1K, 5%, 1/4W	R20102
R83	Res, comp, 27Ω, 5%, 1/4W	R20270

IF/AUDIO PC BD ASSY (CONT.)

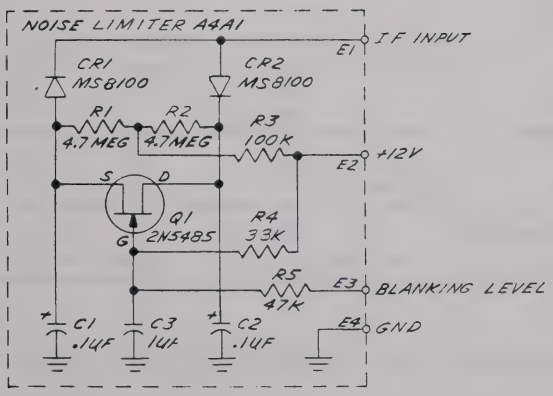
REF DESIG	DESCRIPTION	P/N
R84	Res, comp, 4.7K, 5%, 1/4W	R20472
R85	Res, comp, 1K, 5%, 1/4W	R20102
R86	Res, comp, 1K, 5%, 1/4W	R20102
R87	Not used	---
R88	Res, comp, 10Ω, 5%, 1/4W	R20100
R89	Res, comp, 470Ω, 5%, 1/4W	R20471
R90	Res, comp, 2.2K, 5%, 1/4W	R20222
R91	Res, comp, 3.3K, 5%, 1/4W	R20332
R92	Res, comp, 6.8K, 5%, 1/4W	R20682
R93	Not used	---
R94	Res, comp, 1.8K, 5%, 1/4W	R20182
R95	Res, comp, 470Ω, 5%, 1/4W	R20471
R96	Res, comp, 1K, 5%, 1/4W	R20102
R97	Res, comp, 10Ω, 5%, 1/4W	R20100
R98	Res, comp, 2.2K, 5%, 1/4W	R20222
R99	Res, comp, 10Ω, 5%, 1/4W	R20100
R100	Res, comp, 560Ω, 5%, 1/4W	R20561
R101	Res, comp, 1K, 5%, 1/4W	R20102
R102	Res, comp, 4.7K, 5%, 1/4W	R20472
R103	Res, comp, 1K, 5%, 1/4W	R20102
R104	Res, comp, 27Ω, 5%, 1/4W	R20270
R105	Pot, trim, pc, 100Ω	R88101
R106	Res, comp, 1K, 5%, 1/4W	R20102
R107	Res, comp, 1K, 5%, 1/4W	R20102
R108	Res, comp, 1.5K, 5%, 1/4W	R20152
R109	Res, comp, 5.6K, 5%, 1/4W	R20562
R110	Res, comp, 1K, 5%, 1/4W	R20102
R111	Res, comp, 18K, 5%, 1/4W	R20183
R112	Res, comp, 18K, 5%, 1/4W	R20183
R113	Res, comp, 6.8K, 5%, 1/4W	R20682
R114	Res, comp, 6.8K, 5%, 1/4W	R20682
R115	Not used	---
R116	Res, comp, 4.7K, 5%, 1/4W	R20472
R117	Res, comp, 22K, 5%, 1/4W	R20223
R118	Res, comp, 6.8K, 5%, 1/4W	R20682
R119	Res, comp, 5.6K, 5%, 1/4W	R20562
R120	Res, comp, 4.7K, 5%, 1/4W	R20472
R121	Res, comp, 1.8K, 5%, 1/4W	R20182
R122	Res, comp, 1K, 5%, 1/4W	R20102
R123	Res, comp, 47K, 5%, 1/4W	R20473
R124	Pot, trim, pc, min, 5K	R89502
R125	Res, comp, 220Ω, 5%, 1/4W	R20221
R126	Res, comp, 4.7K, 5%, 1/4W	R20472
R127	Pot, trim, pc, min, 5K	R89502
R128	Res, comp, 2.7K, 5%, 1/4W	R20272
R129	Res, comp, 2.2K, 5%, 1/4W	R20222
R130	Not used	---

IF/AUDIO PC BD ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
R131	Not used	---
R132	Res, comp, 100K, 5%, 1/4W	R20104
R133	Res, comp, 10Ω, 5%, 1/4W	R20100
R134	Res, comp, 100Ω, 5%, 1/4W	R20101
T1	Transformer, if, 1500 kHz	T10006
T2	Transformer, 2-30 MHz, broadband	T10200
T3	Transformer, if, 1500 kHz	T10004
T4	Transformer, if, 455 kHz	T10002
T5	Transformer, if, 455 kHz	T10002
T6	Transformer, if, 455 kHz	T10002
T7	Transformer, if, 455 kHz	T10003
T8	Transformer, if, 455 kHz (delete when FL2 is a ceramic fltr)	T10002
T9	Transformer, if, 455 kHz (delete when FL2 is a ceramic fltr)	T10002
U1	IC, rf ampl, CA-3028A	U3028A
U2	IC, rf ampl, CA-3028A	U3028A
U3	IC, rf ampl, CA-3028A	U3028A
U4	IC, rf ampl, CA-3028A	U3028A
U5	IC, modulator, MC1596G	U1596G
VR1	Diode, zener, 6.8V, 5%, 400 mW, 1N754A	VR7540
VR2	Diode, zener, 5.6V, 5%, 400 mW, 1N752A	VR7520

NOISE LIMITER PC BD ASSY A1

REF DESIG	DESCRIPTION	P/N
---	NOISE LIMITER PC BOARD ASSEMBLY	200880
C1	Cap, tant, 0.1μF, 20%, 35 Vdcw	C41046
C2	Cap, tant, 0.1μF, 20%, 35 Vdcw	C41046
C3	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
CR1	Diode, hot carrier, MS8100	CR0200
CR2	Diode, hot carrier, MS8100	CR0200
Q1	Transistor, j-fet, n-chan, 2N5485	Q54850
R1	Res, comp, 4.7 meg, 5%, 1/4W	R20475
R2	Res, comp, 4.7 meg, 5%, 1/4W	R20475
R3	Res, comp, 100K, 5%, 1/4W	R20104
R4	Res, comp, 33K, 5%, 1/4W	R20333
R5	Res, comp, 47K, 5%, 1/4W	R20473



NOTE:
1. UNLESS OTHERWISE SPECIFIED:
   RESISTANCES ARE IN OHMS.
   RESISTORS ARE ¼ W 5% CARBON.
2. REFER TO IF AUDIO SCHEMATIC
   FOR INTERFACE INFORMATION.

Figure 10-1. Noise Limiter Assembly A4A1, Schematic Diagram

TABLE 10-1. TRANSMIT PATH VOLTAGE INDICATIONS

Test conditions unless otherwise noted:

a. 1 kHz, 0 dbm input audio signal.

b. TRANSMIT AUDIO control set to red jewel.

c. SSB Mode.

d. Transceiver Keyed.

e. Measurements indicated are typical, but actual units vary widely.

TEST POINT LOCATION	SPECIAL CONDITIONS	INDICATION (Referenced to ground)
PCB contact 21		200 MV ac at audio frequency
U5 pins 1 & 4		2.5 Vdc
U5 pin 7		6.2 Vdc 35 MV ac at 455 kHz
U5 pin 6 or 9		8.4 Vdc
Q5 and Q3 base		0 Vdc (Q5 and Q3 off)
Q6 and Q4 base		0.7 Vdc (Bases Q6 and Q4 forward biased)
Q7 collector	Am	0 Vdc (Q7 saturated)
	SSB	6 Vdc (Q7 off)
Q29 base	AM	0.6 Vdc (Q29 on but not saturated)
Junction of C1 and R94 (near Q29)	AM	70 MV ac at 455 kHz
Q1 base		0.6 Vdc (Q1 on but not saturated)

TABLE 10-2. RECEIVE PATH VOLTAGE INDICATIONS

Test Conditions unless otherwise noted:

a. 100 MV receive signal at antenna jack.

b. USB mode.

c. Function switch set to RECEIVE.

d. Measurements indicated are typical, but actual units may vary widely.

TEST POINT LOCATION	SPECIAL CONDITIONS	INDICATION (Referenced to ground)
Q5 and Q3 bases	AM	0.7 Vdc (Base of Q5 and Q3 forward biased)
	SSB	0 Vdc (Q5 and Q3 off)
Q4 and Q6 bases	AM	0 Vdc (Q4 and Q6 off)
	SSB	0.7 Vdc (Bases of Q4 and Q6 forward biased)
U1 pins 1 and 5		7.6 Vdc
U1 pin 8		12 Vdc
U2 pins 1 and 5		7.8 Vdc
U2 pin 6		12 Vdc

TEST POINT LOCATION	SPECIAL CONDITIONS	INDICATION (Referenced to ground)
U3 pin 1	SSB or AM SSB only	7 Vdc 0.1 Vac at 455 kHz
U3 pin 5		7 Vdc
U3 pin 6		7.8 Vdc
Q18 emitter		6.6 Vdc 0.5 Vac at audio frequency
Q20 base		1.75 Vdc
Q22 emitter		7.3 Vdc 2.2 Vac at audio frequency

TABLE 10-3. AGC CIRCUIT VOLTAGE INDICATIONS

Transceiver set for RECEIVE.

TEST POINT LOCATION	SPECIAL CONDITIONS	INDICATIONS (Referenced to ground)
Q9 collector	0 input signal	3.9 Vdc
Q10 Base	100 MV input signal	1.4 Vdc
Q12 Base	100 MV input signal	4.2 Vdc
Q30 Base	100 MV input signal	1.65 Vac at 455 kHz
U4 pin 6 and 8	0 input signal 100 MV input signal	12.2 Vdc 4.8 Vac at 455 kHz
U4 pin 7	0 input signal	5.9 Vdc
R127 wiper contact (near U3)	100 MV input signal	17 MV ac at 455 kHz 7.4 Vdc
Junction of C27 and R74 (near Q8)	0 signal 100 MV input	-1.1V -18.5 Vdc

TABLE 10-4. INJECTION AND CONTROL VOLTAGE INDICATIONS

TEST POINT LOCATION	SPECIAL CONDITIONS	INDICATIONS (Referenced to ground)
Q2 Base	SSB, TX OR RX	1.5 Vdc 200 Mv ac at 1.9 MHz
Q2 collector	SSB, TX OR RX	3.7 Vac at 1.9 MHz
Junction R7 and R4 (near Q2)	SSB, TX OR RX	11.5 Vdc
Q16 emitter	TX	1.3 Vdc
Q14 emitter	RX TX	1.0 Vdc 0 Vdc
Q15 emitter	AM TX	1.4 Vdc

TABLE 10-5. KEYING CIRCUIT INDICATIONS

TEST POINT LOCATION	SPECIAL CONDITIONS	INDICATIONS (Referenced to ground)
Q24 Base	AM TUNE	12 Vdc (Q24 saturated)
Q25 emitter	Not keyed Keyed	7 Vdc 2 Vdc
Q26 collector	Not keyed Keyed	0 Vdc (Q26 saturated) 5 Vdc (Q26 off)
Q27 collector	Not keyed Keyed	12.5 Vdc (Q27 off) 0.2 Vdc (Q27 saturated)

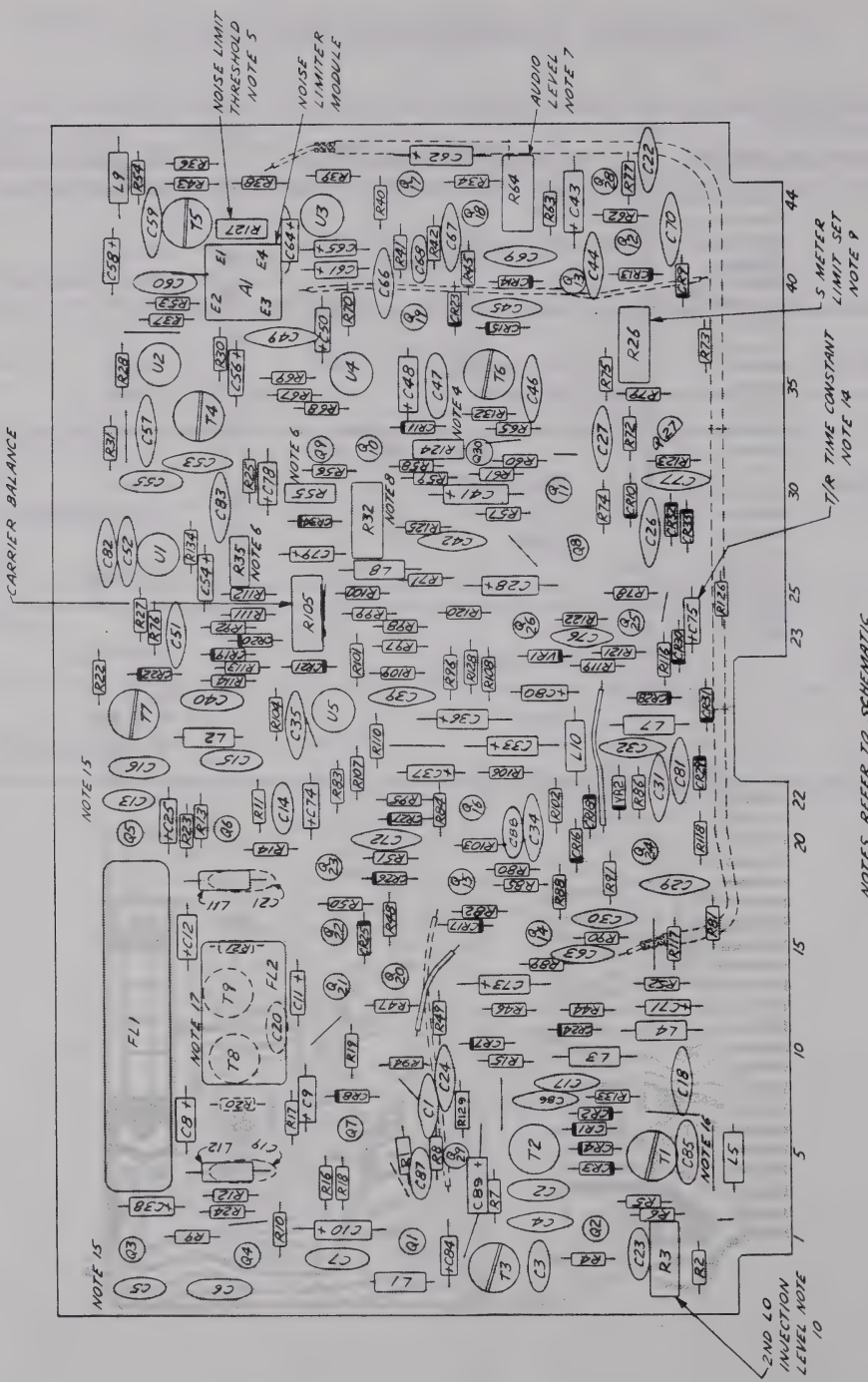
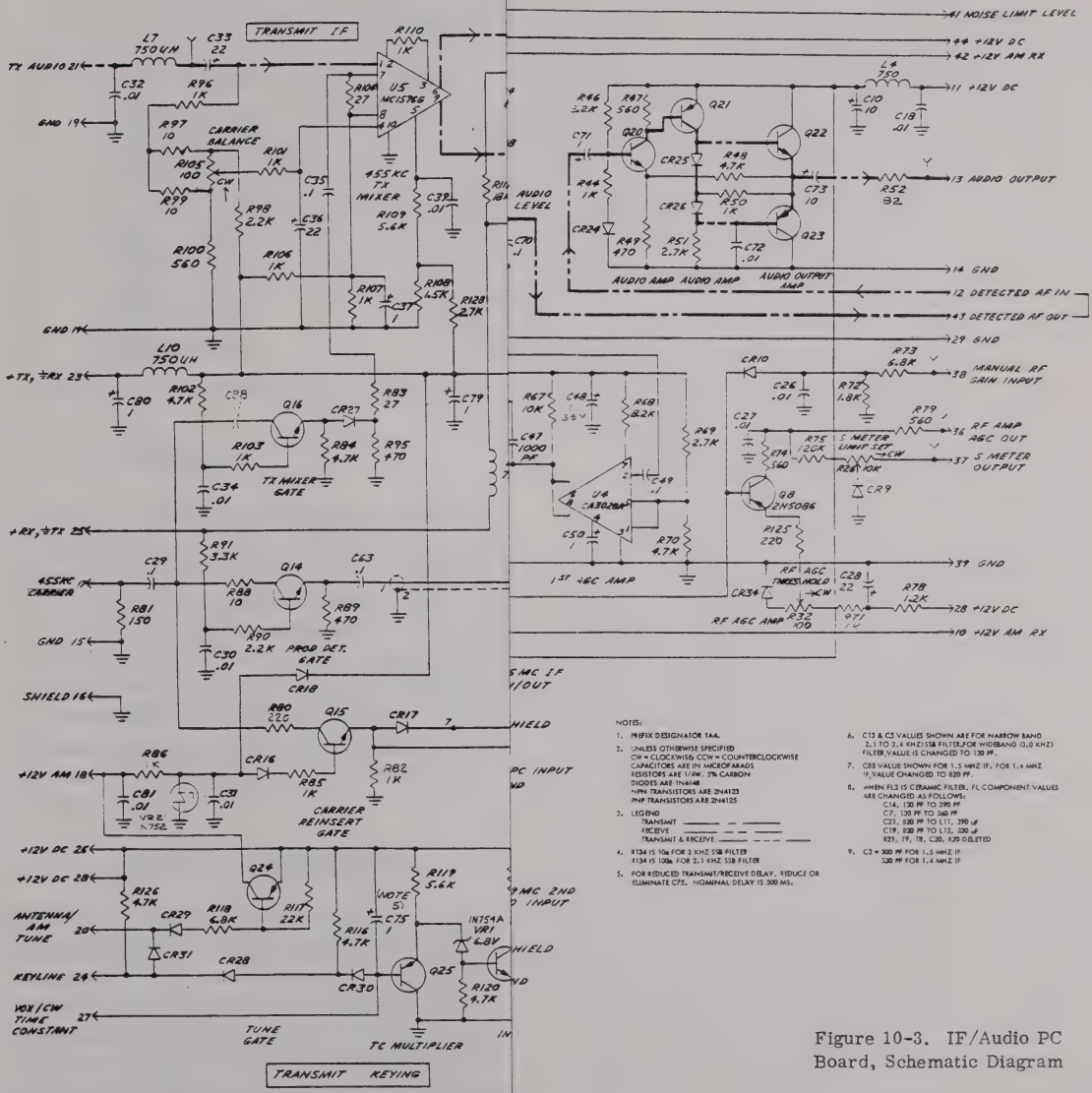


Figure 10-2. IF/Audio PC Board Assembly



NOTES:

1. PREFIX DESIGNATOR 1A4.
2. UNLESS OTHERWISE SPECIFIED
   CW = CLOCKWISE, CCW = COUNTERCLOCKWISE
   CAPACITORS ARE IN MICROFARADS
   RESISTORS ARE 1/4W, 5% CARBON
   DIODES ARE 1N4148
   NPN TRANSISTORS ARE 2N4123
   PNP TRANSISTORS ARE 2N4125
3. LEGEND
   TRANSMIT ——— – ———
   RECEIVE — — —
   TRANSMIT & RECEIVE ——— — — ———
4. R134 IS 10Ω FOR 2.3 KHZ SSB FILTER
   R134 IS 100Ω FOR 2.1 KHZ SSB FILTER
5. FOR REDUCED TRANSMIT/RECEIVE DELAY, REDUCE OR ELIMINATE C75. NOMINAL DELAY IS 300 MS.
6. C13 & C3 VALUES SHOWN ARE FOR NARROW BAND 2.1 TO 2.4 KHZ) SSB FILTER, FOR WIDEBAND (3.0 KHZ) FILTER, VALUE IS CHANGED TO 130 PF.
7. C85 VALUE SHOWN FOR 1.5 MHZ IF; FOR 1.4 MHZ IF, VALUE CHANGED TO 820 PF.
8. WHEN FL2 IS CERAMIC FILTER, FL COMPONENT VALUES ARE CHANGED AS FOLLOWS:
   C14, 130 PF TO 390 PF
   C7, 130 PF TO 360 PF
   C21, 820 PF TO L11, 390 uH
   C19, 820 PF TO L12, 330 uH
   R21, 19, 78, C20, 820 Ω DELETED
9. C3 = 300 PF FOR 1.5 MHZ IF
   330 PF FOR 1.4 MHZ IF

Figure 10-3. IF/Audio PC Board, Schematic Diagram

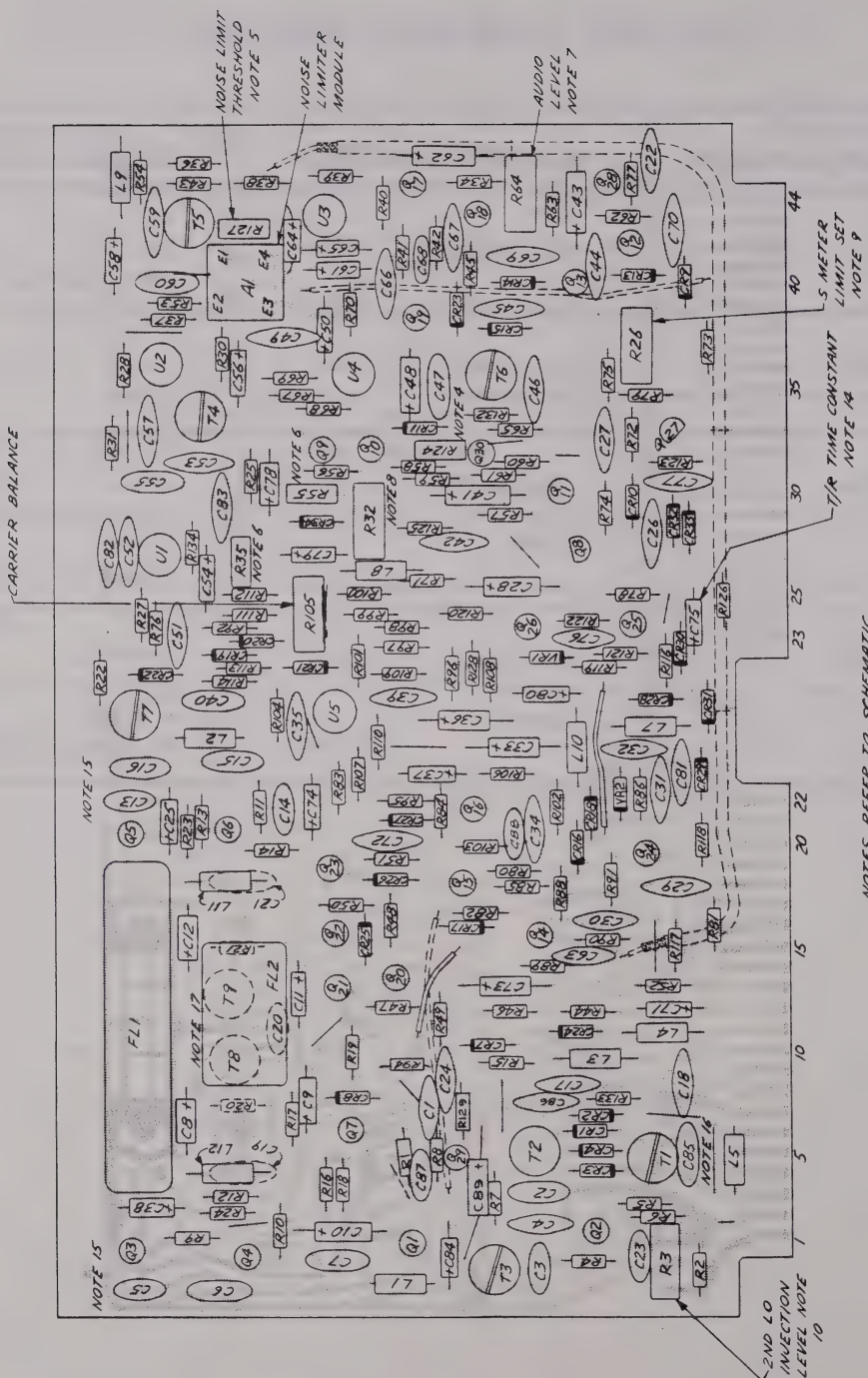
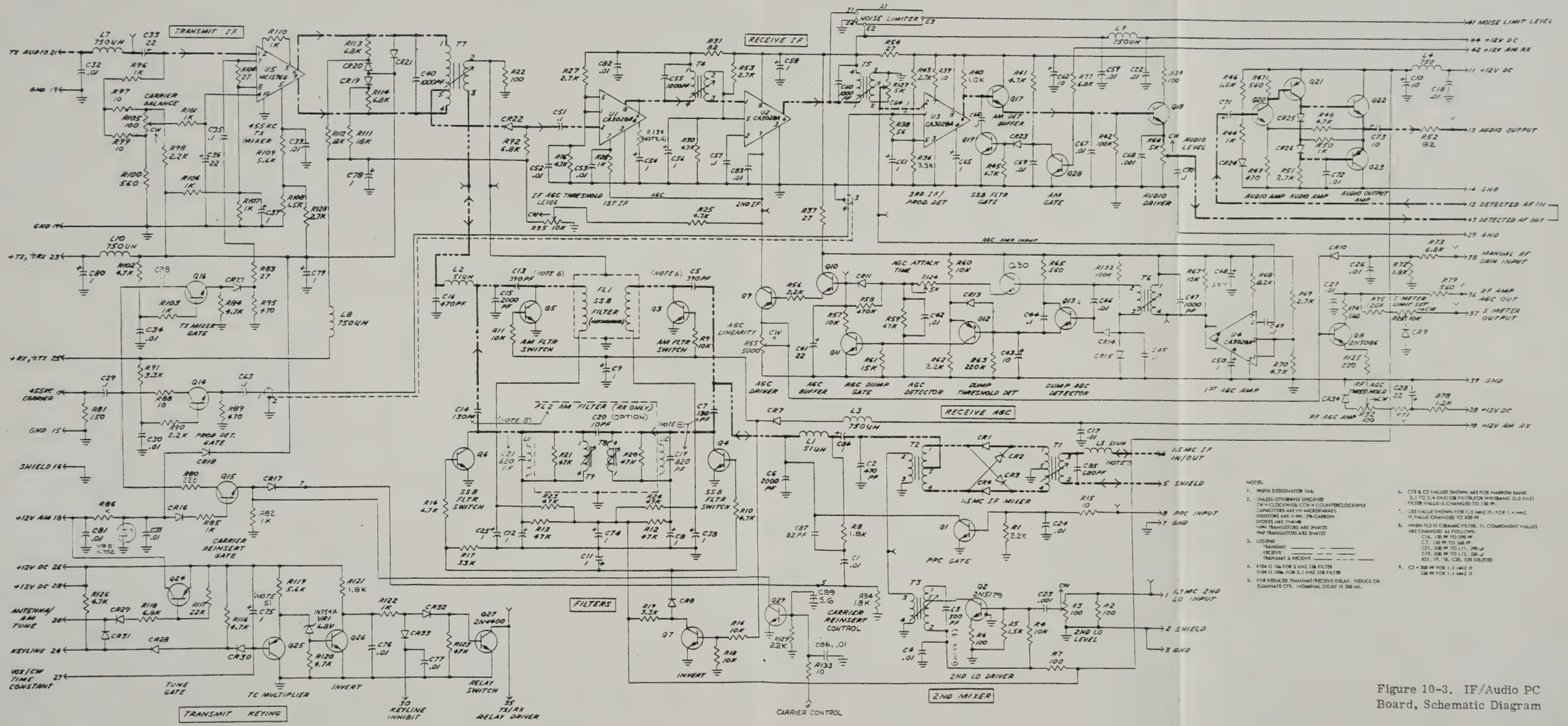


Figure 10-2. IF/Audio PC Board Assembly



NOTES:

1. PREFIX DESIGNATOR 1A4.
2. UNLESS OTHERWISE SPECIFIED CW = CLOCKWISE, CCW = COUNTERCLOCKWISE. CAPACITORS ARE IN MICROFARADS. RESISTORS ARE 1/4W, 5% CARBON. DIODES ARE 1N4148. NPN TRANSISTORS ARE 2N4123. PNP TRANSISTORS ARE 2N4125.
3. LEGEND: TRANSMIT ——— RECEIVE - - - - TRANSMIT & RECEIVE — · — · —
4. R134 IS 10Ω FOR 3 KHZ SSB FILTER. R134 IS 100Ω FOR 2.1 KHZ SSB FILTER.
5. FOR REDUCED TRANSMIT/RECEIVE DELAY, REDUCE OR ELIMINATE C75. NOMINAL DELAY IS 300 MS.
6. C13 & C5 VALUES SHOWN ARE FOR NARROW BAND 2.1 TO 2.4 KHZ SSB FILTER. FOR WIDEBAND (3.0 KHZ) FILTER VALUE IS CHANGED TO 130 PF.
7. C85 VALUE SHOWN FOR 11.5 MHZ IF. FOR 1.4 MHZ IF, VALUE CHANGED TO 820 PF.
8. WHEN FL2 IS CERAMIC FILTER, FL COMPONENT VALUES ARE CHANGED AS FOLLOWS: C16, 130 PF TO 390 PF; C7, 130 PF TO 560 PF; C21, 820 PF TO L11, 390 uH; C19, 820 PF TO L12, 220 uH; R21, 19, 18, C20, 839 DELETED.
9. C3 = 300 PF FOR 11.5 MHZ IF; 330 PF FOR 1.4 MHZ IF.

Figure 10-3. IF/Audio PC Board, Schematic Diagram

CHAPTER 11
AC POWER SUPPLY ASSY A5

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Figure 11-2	Regulator Board A5A1
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Figure 11-4	Sine/Square AC Power Supply Schematic

11.1 GENERAL.

There are four basic power supplies for the Transceiver: 115/230 Vac sine wave, 115 Vac sine/square wave, 13.2 Vdc, and 26.4 Vdc. They are interchangeable, with a plug in, screw mount arrangement. The ac supplies have a 115/230 Vac or SINE/SQUARE selector switch, which is accessable when a rear panel hole plug is removed. The ac power supplies are covered in this chapter, and the dc power supplies are covered in Chapter 12.

11.2 THEORY OF OPERATION.

The AC Power Supply consists of power transformer T1, which supplies 12.6 Vac for tube heaters and ovens, 24 Vac for the remote control motor and antenna coupler or linear power amplifier channel motors, and all voltages required for the rectifiers of the Regulator and Filter Board Assembly A5A1. Refer to schematic diagram Figure 11-3. Line switch S2 is used to connect the double primaries of T1 either in parallel for 117 Vac operation, or in series for 234 Vac operation; or in the case of sine/square operation (Figure 11-4), it switches taps on the primary and secondary. If the nominal line voltage is either 10% high or low, reconnect the taps as shown on the schematic.

The Regulator Board contains four rectifier circuits and a regulator. Diodes CR1 through CR8 comprise the rectifier for the +750 Vdc power amplifier plate voltage. Diodes CR9 through CR12 provide the +240 Vdc for the driver plate supply and power amplifier screen supply. It should be noted that the 250μF filter capacitor A3C13 for this supply is housed in the RF Amplifier chassis. Diode CR13 is the rectifier for the -140 Vdc supply.

Diodes CR14 and CR15 provide unregulated dc for the series regulator circuit. The regulator consists of series pass transistor Q1, mounted on the chassis, and differential amplifier and driver transistors Q1 through Q4 on Regulator Board A5A1. Potentiometer R15 is used to adjust the output of the regulator to +12.6 Vdc.

In the standby mode of operation, a ground level is applied on pin 4 of the regulator/filter board. A ground on this line shunts base drive from transistor Q1 through diode CR16. With base drive removed from driver transistor Q1, the regulator is turned off; and voltage is removed from the 12.6 Vdc regulated supply output.

11.3 LINE VOLTAGE JUMPER WIRING.

The ac power supplies have transformer primary taps to allow rewiring for high or low line voltage. (Refer to appropriate schematic diagram for connection details.) If it is suspected that line voltage is high or low from nominal, the line voltage should be checked under normal load. If it is necessary, rewire input leads only to different transformer taps as indicated in the schematic diagrams. Do not reconnect the blower motor output lead to a different tap, as it should remain connected to the 115 Vac tap as shown.

REF DESIG	DESCRIPTION	P/N
---	POWER SUPPLY MODULE (115/230 Vac)	200400
	(Sine/Square)	210400
A1	Regulator PC Board Assembly	200440
A2	Filter PC Board Assembly	210402
C1	Cap, cer, .0047μF, 10%, 500 Vdcw	C10047
C2	Cap, cer, .0047μF, 10%, 500 Vdcw	C10047
F2	Fuse, 3AG, slo-blo, 0.25 Amp	F20025
F3	Fuse, 3AG, slo-blo, 5 Amp	F20500
	(with Remote, 10 Amp)	(F21000)
F4	Fuse, slo-blo, 10 Amp	F21000
F5	Fuse, 3AG, slo-blo, 2 Amp	F20200
F6	Fuse, as listed below:	
	115 Vac: Fuse, 3AB, 15 Amp	F11500
	230 Vac: Fuse, 3AG, fast-blo, 5 Amp	F10500
J1	Recept, ac power	J00203
J2	Socket, octal type, 8 pins	X00701
J3	Recept, 2 socket, in-line	J00202
Q1	Transistor, npn, power, MJE-3055	Q00001
S1	Switch, slide, 3 pdt, slot (Sine/Square only)	S00203
	OR Switch, slide, dpdt, 115/230 Vac	S00200
T1	Transformer, main power (115/230 Vac)	T00100
	OR Transformer, main power, sine/square, 115 Vac	T00104
XF2	Fuseholder, standard	X00400
XF3	Fuseholder, standard	X00400
XF4	Fuseholder, standard	X00400
XF5	Fuseholder, standard	X00400

REGULATOR FILTER PC BD ASSY A1

REF DESIG	DESCRIPTION	P/N
---	REGULATOR FILTER PC BOARD ASSEMBLY	200440
C1	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C2	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C3	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C4	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C5	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C6	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C7	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C8	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C9-C11	Not used	---
C12	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C13	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C14	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C15	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
C16	Not used	---
C17	Cap, elect, 500μF, 50 Vdcw	C70003
C18	Cap, tant, 5.6μF, 10%, 35 Vdcw	C45656
C19	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C20	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C21	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
CR1	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR2	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR3	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR4	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR5	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR6	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR7	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR8	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR9	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR10	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR11	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR12	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR13	Diode, si, 1 Amp, 1 kV, 1N4007	CR4007
CR14	Diode, si, 3 Amp, 100V, 3AF1	CR3AF1
CR15	Diode, si, 3 Amp, 100V, 3AF1	CR3AF1
CR16	Diode, si, signal, 1N4148	CR4148
CR17	Diode, si, signal, 1N4148	CR4148
CR18	Diode, si, signal, 1N4148	CR4148
FL1	Ferrite bead	FL0004
L1	Choke, rf, 1 mH	L10102
Q1	Transistor, npn, 2N1613	Q16130
Q2	Transistor, npn, 2N4400	Q44000

REGULATOR FILTER PC BD ASSY A1 (CONT.)

REF DESIG	DESCRIPTION	P/N
Q3	Transistor, npn, 2N4123	Q41230
Q4	Transistor, npn, 2N4123	Q41230
R1-R3	Not used	---
R4	Res, comp, 47K, 5%, 2W	R50473
R5	Res, comp, 100K, 5%, 2W	R50104
R6	Res, comp, 33K, 5%, 2W	R50333
R7	Res, comp, 10K, 5%, 1/4W	R20103
R8	Res, comp, 10Ω, 5%, 1/4W	R20100
R9	Res, comp, 2.2K, 5%, 1/4W	R20222
R10	Res, comp, 4.7K, 5%, 1/4W	R20472
R11	Res, ww, 1Ω, 2W	R90001
R12	Res, ww, 1Ω, 2W	R90001
R13	Res, comp, 1K, 5%, 1/4W	R20102
R14	Res, comp, 220Ω, 5%, 1/4W	R20221
R15	Pot, trim, pc, 1K	R88102
R16	Res, comp, 1K, 5%, 1/4W	R20102
R17	Res, comp, 270Ω, 5%, 1/4W	R20271
R18	Res, comp, 270Ω, 5%, 1/4W	R20271
R19	Res, comp, 3.3K, 5%, 1/4W	R20332
VR1	Diode, zener, 15V, 5%, 1W, 1N4744A	VR4744
VR2	Diode, zener, 5.6V, 5%, 400 mW, 1N752A	VR7520

FILTER PC BD ASSY A2

REF DESIG	DESCRIPTION	P/N
---	FILTER PC BOARD ASSEMBLY	210402
C1-C8	Not used	---
C9	Cap, elect, 60μF, 450 Vdcw	C70001
C10	Cap, elect, 60μF, 450 Vdcw	C70001
C11	Cap, elect, 60μF, 450 Vdcw	C70001
C12-C15	Not used	---
C16	Cap, elect, 200μF, 150 Vdcw	C70002
R1	Res, comp, 100K, 5%, 2W	R50104
R2	Res, comp, 100K, 5%, 2W	R50104
R3	Res, comp, 100K, 5%, 2W	R50104

TABLE 11-1. VOLTAGE CHART

NOTE

The following voltages and waveforms are obtained when the supply is connected to a 117 Vac source. All plugs and receptacles of the supply should be mated with corresponding receptacles of the radio, and the radio should be set to the RECEIVE mode.

TEST POINT LOCATION	VOLTAGE OR WAVEFORM	COMMENTS
J2 pin 1 (+ HV) and pin 8 (common)	+750 ± 75 Vdc	WARNING: Dangerous high Voltage.
J2 pin 3 (-) to pin 8 (common)	-120 ± 20 Vdc	
J2 pin 2 (+) to pin 8 (common)	+240 ± 25 Vdc	WARNING: Dangerous high Voltage.
J2 pin 4 (+) J2 pin 8 (common)	+12.6 ± 0.5 Vdc	This is the regulated dc output and should have less than 150 MV peak to peak ripple.
J2 pin 5 and 6 to pin 7	+12.6 ± 0.6 Vrms	This voltage is applied to Transceiver filaments.
Cathode of A1CR17 (-) to chassis ground.	-0.6 ± 0.3 Vdc	A positive indication at this point indicates the loss of the -120 Vdc bias supply.

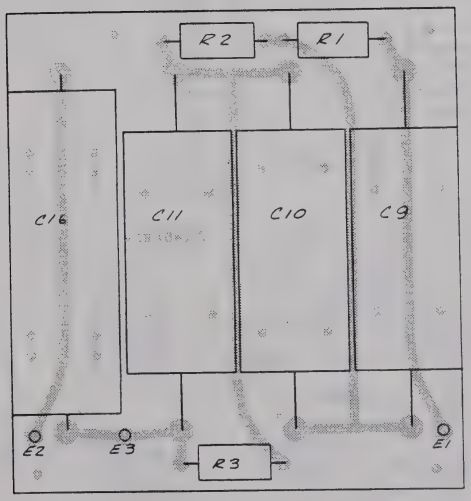


Figure 11-1. Filter PC Board Assembly A5A2

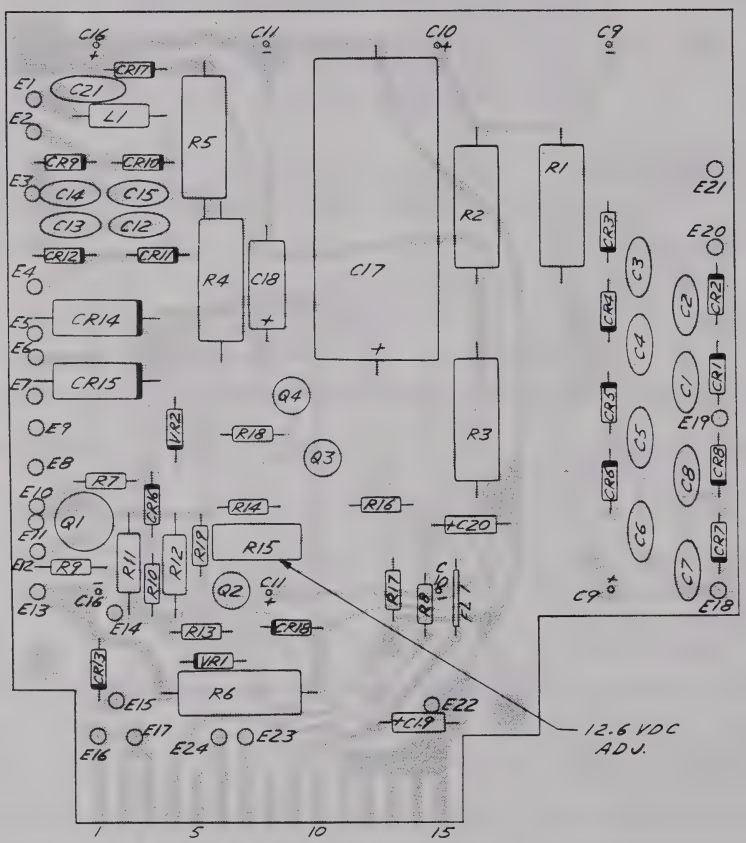


Figure 11-2. Regulator PC Board Assembly A5A1

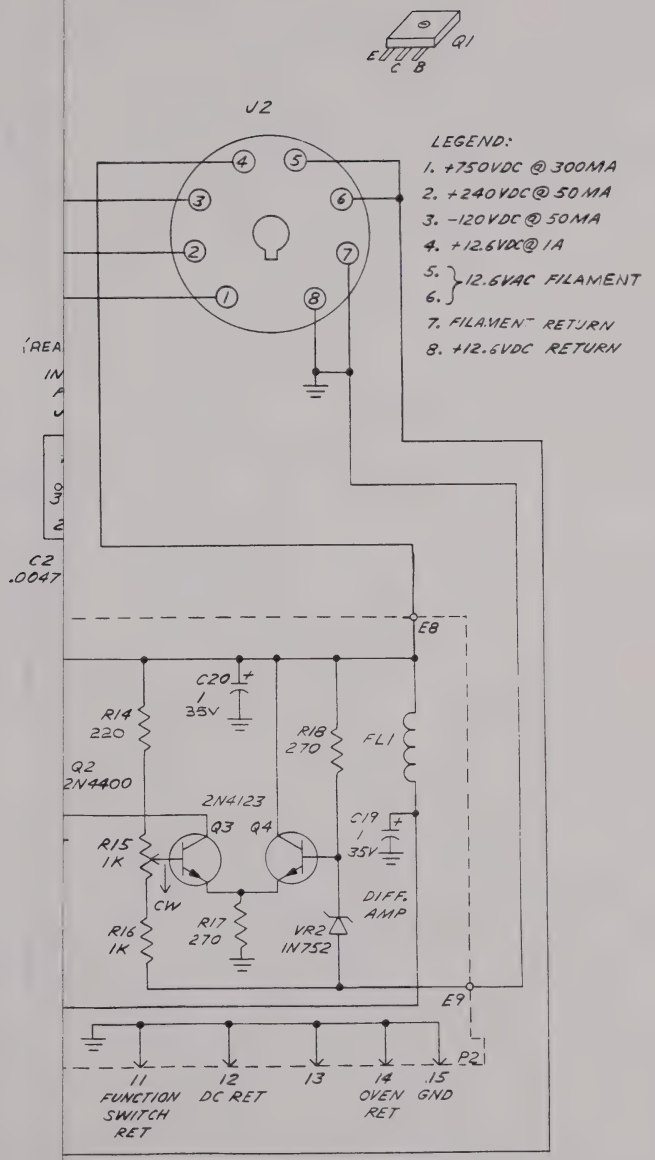


Figure 11-3. AC Power Supply (115/230 Vac) Schematic Diagram

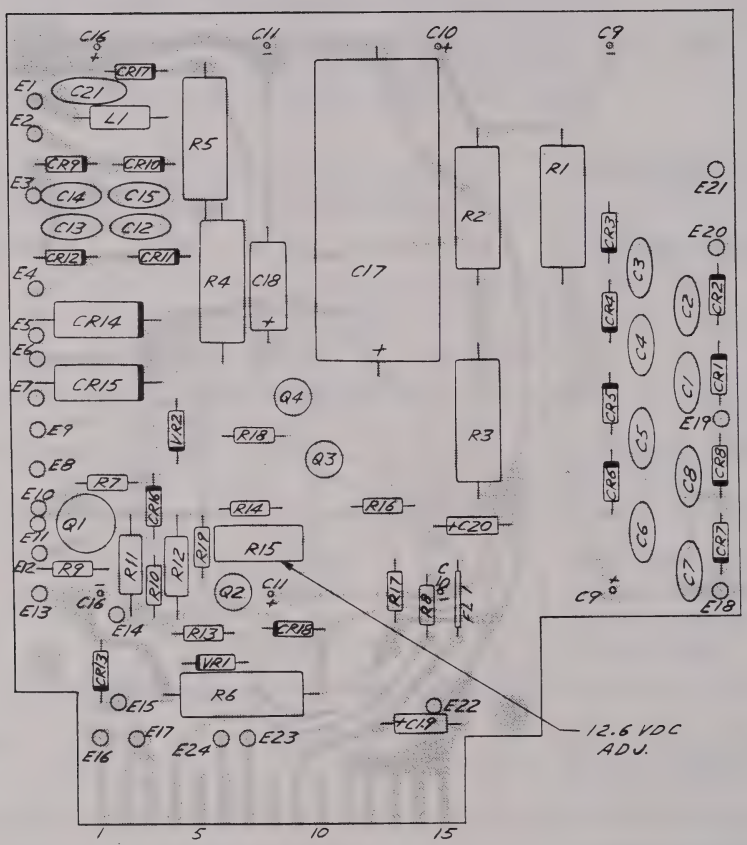
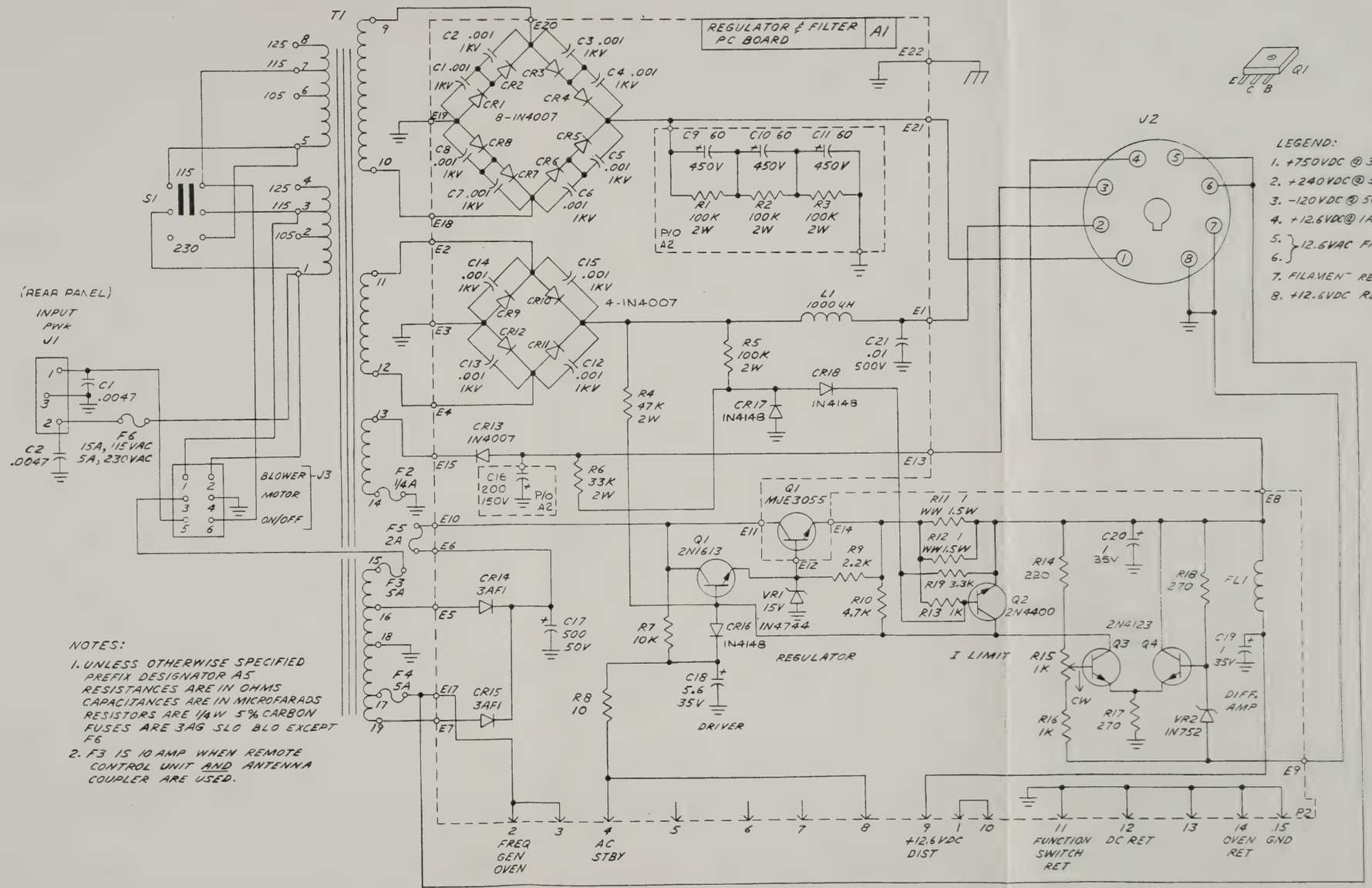


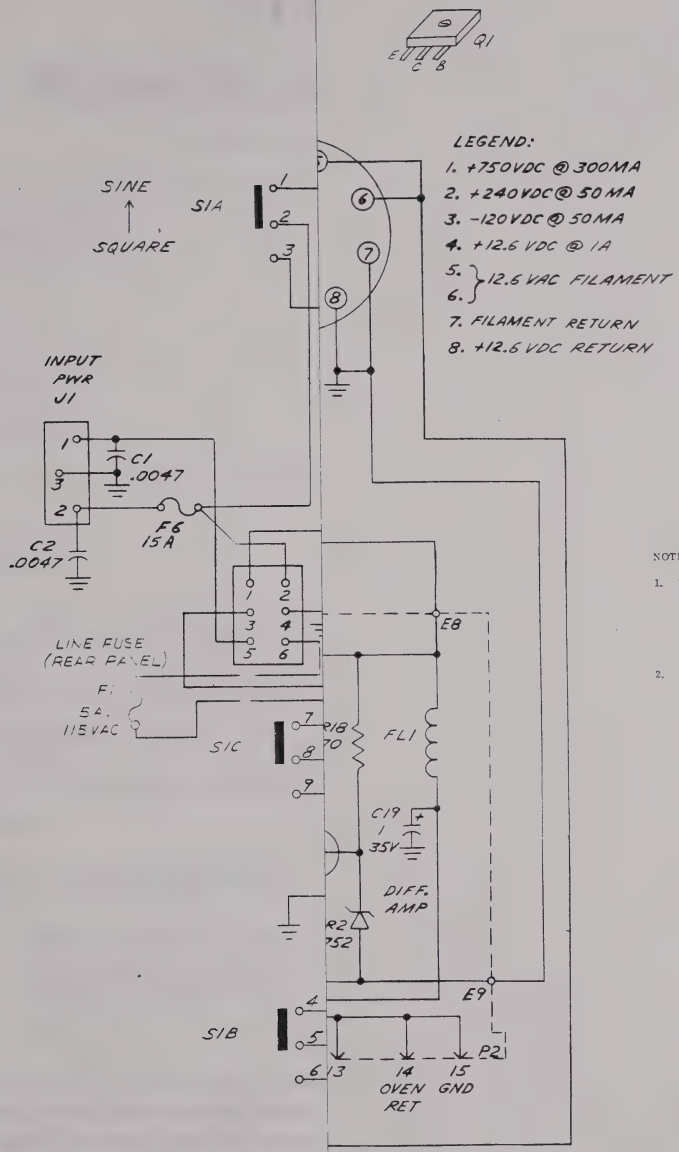
Figure 11-2. Regulator PC Board Assembly A5A1



NOTES:

1. UNLESS OTHERWISE SPECIFIED PREFIX DESIGNATOR A5 RESISTANCES ARE IN OHMS CAPACITANCES ARE IN MICROFARADS RESISTORS ARE 1/4W 5% CARBON FUSES ARE 3AG SLO BLO EXCEPT F6
2. F3 IS 10 AMP WHEN REMOTE CONTROL UNIT AND ANTENNA COUPLER ARE USED.

Figure 11-3. AC Power Supply (115/230 Vac) Schematic Diagram



NOTES:

1. Unless otherwise specified
   Prefix Designator A5
   Resistances are in ohms
   Capacitances are in microfarads
   Resistors are 1/4W 5% carbon
   Fuses are 3AG SLO-BLO except F6.

2. F3 is 10 Amp when Remote Control Unit and Antenna Coupler are used.

Figure 11-4. AC Power Supply (SINE/SQUARE) Schematic Diagram

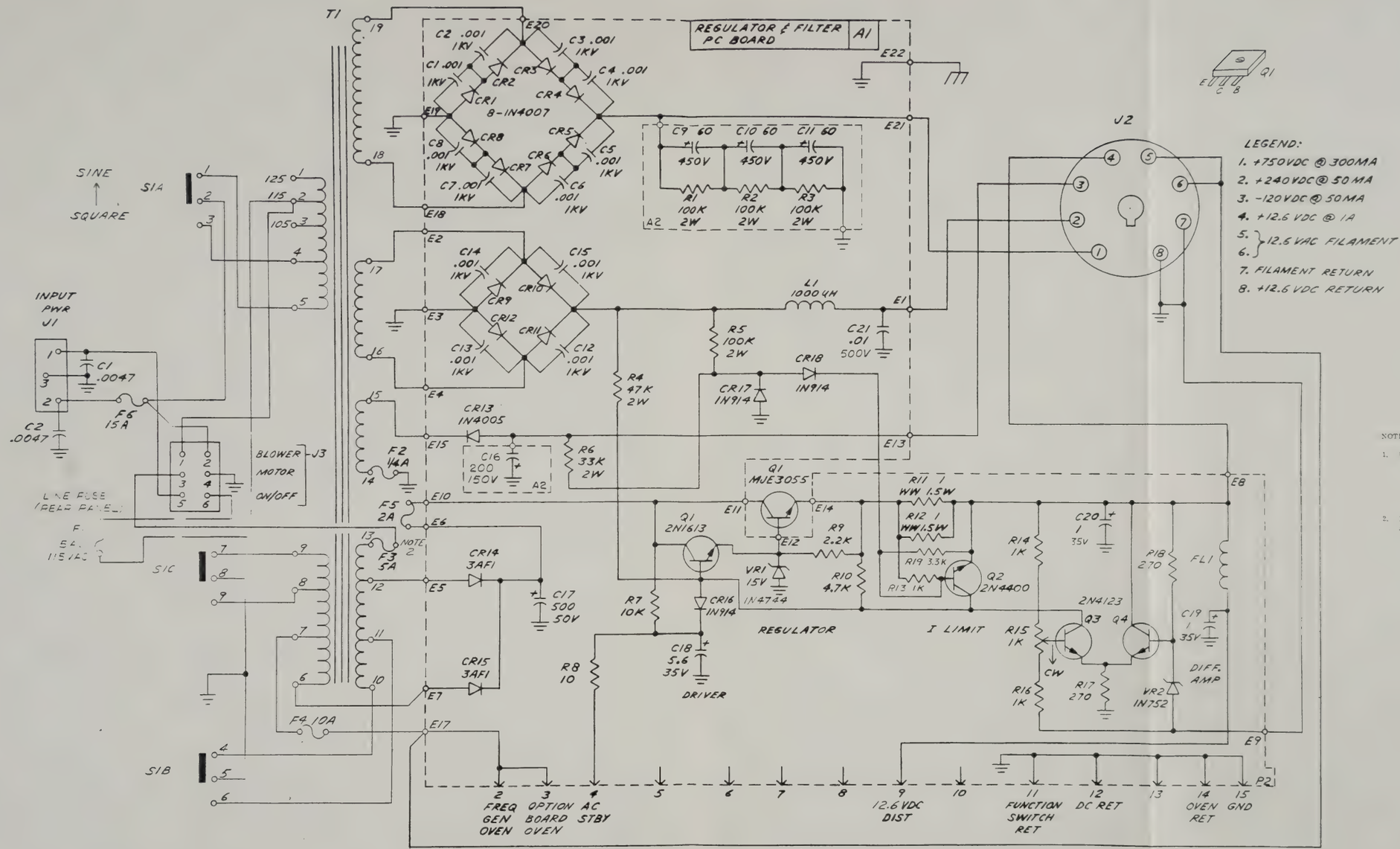


Figure 11-4. AC Power Supply (SINE/SQUARE) Schematic Diagram

CHAPTER 12
DC POWER SUPPLY ASSY A5

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Paragraph 12.1	General
Paragraph 12.2	13.6 Volt Operation
Paragraph 12.3	26 Volt Operation
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Table 12-1	Voltage and Waveform Chart
Figure 12-1	Regulator/Filter PC Board A1
Figure 12-2	Starting Circuit PC Board A2
Figure 12-3	13.6 VDC Power Supply Schematic
Figure 12-4	26 VDC Power Supply Schematic

12.1 GENERAL.

The DC Power Supply enables operation of the SR-206/210 Transceiver on power sources of 13.2 or 26.4 Vdc (12 to 14 Vdc or 24 to 28 Vdc). It is installed in place of the AC Power Supply in sets for dc operation. Input power required for full output is 13.2 Vdc at 25 Amps or 26.4 Volts at 15 Amps.

12.2 BASIC 13.2 VOLT OPERATION.

The DC Power Supply consists of a two-transformer dc-dc converter and a 12.5 Vdc regulator. Refer to schematic diagram, figure 12-3.

Transistors Q1 and Q2 are used in a push-pull square wave oscillator circuit which alternately supplies current pulses to each half of the primary of power transformer T1. Positive feedback to the bases of transistors Q1 and Q2 is provided by saturating transformer A2T1. Transformer A2T1 will apply base current for approximately 100μsec, at which time the transformer saturates, base drive is reduced to zero, and drive is removed from both transistors. When the driven transistor is turned off, the field of power transformer T1 collapses, reversing the voltage across its primary windings. This voltage reversal is applied to transformer A2T1, which now turns the other transistor on for a period of approximately 100 μsec, and then the cycle repeats itself. In this manner, transistors Q1 and Q2 oscillate at a 5 kHz rate, effectively applying a square wave voltage to the primary of power transformer T1. The secondary windings of T1 supply the voltages for the Regulator and Filter PC Board.

The square wave oscillator mentioned above is operated in class B; and if it were not for the starting circuit, both transistors would be off when power is first applied, and no oscillations would occur. To overcome this situation, base current is initially applied to both transistors: Q1 and Q2. Any circuit unbalance or transient causes the circuit to oscillate in the class A mode. As soon as oscillation has been established, the class A bias current is removed, and the circuit oscillates in its normal class B mode.

Starting is accomplished by the Starting Circuit PCB, A5A2. As battery power is initially applied from relay K1, capacitors A2C2 and A2C3 charge through the base of transistor A2Q3. Transistor A2Q3 is turned on by this charging current, and thus turns on transistor A3Q2 and power transistor A2Q1. When transistor A2Q1 is turned on, approximately four Amp is applied to the center secondary terminal of transformer A2T1. This current is applied through the secondary of the transformer to the bases of power switching transistors Q1 and Q2. As A2C1, A2C2, and A2C3 approach full charge, charging current is reduced to the point that transistor A2Q3 cuts off, cutting off transistors A2Q2 and A2Q1. The starting current is present approximately 1/2 second; sufficient for Q1 and Q2 to start oscillating. Operation then continues in class B.

NOTE

If a malfunction of the radio causes an overload to the output of the supply, the oscillator will stop, and all converted voltage will be removed. If the overload is removed, the oscillator will not start unless the Transceiver is returned to either the OFF or STANDBY position, and back to RECEIVE or TRANSCEIVE.

The Regulator/Filter Board contains four rectifier circuits and a regulator. Diodes CR1 through CR8 comprise the rectifier for the +750 Vdc power amplifier plate voltage. Diodes CR9 through CR12 provide the +240 Vdc driver plate and power amplifier screen voltage. Diode CR13 is the rectifier for the -120 Vdc supply.

Diodes CR14 and CR15 provide unregulated dc for the series regulator circuit. The regulator consists of series pass transistor A5Q4 on the Regulator Board. Potentiometer R15 is factory set (and sealed) to adjust the output of the regulator to +12.5 Vdc. Do not reset this control.

Current limiting and short circuit protection is provided by the circuit of transistor Q2. If a current of greater than 1 Amp is drawn from the supply, the voltage drop across resistors R11 and R12 turns on and saturates limiting transistor Q2, which in turn reduces the drive to the series pass transistor, and the output voltage falls.

When the Transceiver is switched from OFF to STANDBY, a contact closure establishes continuity between pins 5 and 6 of power supply jack J3, and Q4 is energized. When Q4 is energized, battery voltage is applied to crystal ovens through pins 2 and 3 of the Regulator/Filter PCB, A5A1. Thus, in the standby mode, the only power in the Transceiver is applied to the ovens.

When the Transceiver Function switch is set to either the RECEIVE or TRANSCEIVE position, + battery voltage is applied to relay K1 through pin 5 of the A5A1 Regulator/Filter PCB. When relay K1 is energized, battery power is applied to power switching transistors A5Q2 and to the A5A2 Starting Circuit PCB.

12.3 26.4 VOLT OPERATION.

26.4 Vdc operation is accomplished by making changes in several components and connections as shown in figure 12-4. Otherwise, operation is similar.

For operation with the SR-1602 Remote Control System or the SR-610M Antenna Coupler, an additional circuit change is required to provide ballast resistance for the 12 Vdc motors. See schematic. R9 is 30Ω for the SR-1601/1602 and 25Ω for the SR-610M. VR1 provides a bypass for motor start current. If both Remote Control and Antenna Coupler are required, the ballast resistors will be installed in the respective units.

DC POWER SUPPLY ASSY A5

REF DESIG	DESCRIPTION	P/N
---	DC POWER SUPPLY ASSEMBLY	200400
A5A1	Regulator/Filter PC Board Assembly	200460
A5A2	Start Circuit PC Board Assembly	200470
C1	Capacitor, 500μF, 50V	C70003
C2	Capacitor, 50μF, 50V	C55067
C3	Capacitor, mylar, 0.1μF, 10%, 100 Vdcw	C20100
C4	Capacitor, mylar, 0.1μF, 10%, 100 Vdcw	C20100
C5	Capacitor, mylar, 0.1μF, 10%, 100 Vdcw	C20100
C6	Capacitor, mylar, 0.1μF, 10%, 100 Vdcw	C20100
C7	Capacitor, 1μF, 50V	200035
C8	Capacitor, 1μF, 50V	200035
C9	Capacitor, 1μF, 50V	200035
C10	Capacitor, .01μF, 10%, 500 Vdcw	C10100
C11	Capacitor, 0.22μF, 10%, 100 Vdcw	C20220
C12	Capacitor, .01μF, 10%, 500 Vdcw	C10100
CR1	Diode, si, 1 Amp, 200V, 1N4003	CR4003
CR2	Not used	---
CR3	Not used	---
CR4-CR5	Diode, si, 1 Amp, 200V, 1N4003	CR4003
F1	Fuse, slo-blo, 0.25A	F20025
F2	Fuse, slo-blo, 2A	F20200
F3	Fuse, slo-blo, 5A	F20500
F4	Fuse, slo-blo, 5A	F20500
F5	Fuse, slo-blo, 25A, 13.6V Unit	F22500
	Fuse, std, 15A, 26V Unit	F11500
F6	Fuse, slo-blo, 5A	F20500
F7	Fuse, slo-blo, 25A	F22500
F8	Fuse, slo-blo, 5A	F20500

DC POWER SUPPLY ASSY A5 (CONT.)

REF DESIG	DESCRIPTION	P/N
J1	Receptacle, 4 pin, Bat. Cable	J00208
J2	Receptacle, octal, 8 pin	X00701
J3	Receptacle, 6 pin	J00205
J4	Receptacle, 6 pin	J00205
K1	Relay, spdt, 25A, 12.5V	K10003
L1	Choke, 18μH, 25A	L32009
L2	Choke, 18μH, 25A	L32009
L3	Choke, 18μH, 25A	L32009
L4	Choke, 18μH, 25A	L32009
L5	Choke, hash, 5A	L32010
L6	Choke, hash, 5A	L32010
L7	Choke, 100μH, 2A	200464
L8	Choke, 100μH, 2A	200464
L9	Choke, 100μH, 2A	200464
P1	Plug, 4 pin, high current	P00208
P2	Plug, 6 pin	P00205
Q1	Transistor, 2N5085, 13.6 Volt Unit	Q56850
	Transistor, 2N5303, 26 Volt Unit	Q53030
Q2	Transistor, 2N5085, 13.6 Volt Unit	Q56850
	Transistor, 2N5303, 26 Volt Unit	Q53030
Q3	Transistor, MJE3055	Q00001
Q4	Transistor, MJE3055	Q00001
R1	Res, ww, 35Ω, 12W	R90004
R2	Res, ww, 35Ω, 12W	R90004
R3	Res, ww, 1Ω, 8W	R90003
R4	Not used	---
R5	Res, 130Ω, 3W, Ohmite 2763, 26V	206100
R6	Res, 130Ω, 3W, Ohmite 2763, 26V	206100
R7	Res, 62Ω, 5W, Ohmite 2865, 26V	206101
R8	Res, 7.5Ω, 25W, Dale RH-25, 26V, SR-210 Oven	206102
	Res, 10Ω, 25W, Dale RH-25, 26V, SR-206 Oven	206103
R9	Res, 25Ω, 25W, Dale RH-25, 26V with SR-606/610	206104
	Res, 30Ω, 25W, Dale RH-25, 26V with SR-1601/1602	206105
R10	Res, value factory selected	---
R11	Res, 100Ω, 2W, 13.6 Volt Unit	R50101
	Res, 270Ω, 5W, 26 Volt Unit	206106
R12	Res, 1K, 5%, 1/4W	R20102
R13-R15	Not used	---
R16	Res, ww, 1Ω, 8W	R90003
R17	Res, comp, 5%, 2W: For 13.6V 180Ω	R50181
	For 26V 560Ω	R50561

REGULATOR/FILTER PC BD ASSY A5A1

REF DESIG	DESCRIPTION	P/N
A5A1	Regulator/Filter PC Board Assembly	200460
C1	Capacitor, Elect, 60 μf, 450 VDC	C70001
C2	Capacitor, Elect, 60 μf, 450 VDC	C70001
C3	Capacitor, Elect, 60 μf, 450 VDC	C70001
C4	Capacitor, Disc, .01, 500 VDC	C10100
C5	Capacitor, Elect, 200 μf, 150 VDC	C70002
C6	Capacitor, Tant, 1 μf, 50 VDC	200035
C7	Capacitor, Elect, 500 μf, 50 VDC	C70003
C8	Capacitor, Tant, 1 μf, 50 VDC	200035
C9	Capacitor, Disc, .01 μf, 1.6 KV	C00001
C10	Capacitor, Disc, .01 μf, 1.6 KV	C00001
C11	Capacitor, Disc, .01 μf, 1.6 KV	C00001
C12	Capacitor, Disc, .01 μf, 500V	C10100
C13 thru C15	Capacitor, Disc, .01 μf, 500V	C10100
CR1 thru CR12	Diode, Solitron TS-60, 600V	CR0201
CR13	Diode, Solitron TS-60, 600V	CR0201
CR14	Diode, NS3001, 100V, 3A	CR0202
CR15	Diode, NS3001, 100V, 3A	CR0202
CR16	Diode, 1N4003, 200V, 1A	CR4003
CR17	Diode, Si, 1N4003	CR4003
CR18	Diode, Si, 1N4003	CR4003
CR19	Diode, 1N4003, 200V, 1A	CR4003
CR20	Diode, 1N4003, 200V, 1A	CR4003
FL1	Choke, Ferrite Bead	FL0002
FL2	Choke, Ferrite Bead	FL0002
L1	Choke, 1000 μh	L10102
L2	Choke, 1000 μh, 800mA	L32015
L3	Choke, 100 μh, 2A	200464
Q1	Transistor, 2N1613, Si, NPN	Q1€130
Q2	Transistor, 2N4400, Si, NPN	Q44000
Q3	Transistor, 2N4123, Si, NPN,	Q41230
Q4	Transistor, 2N4123, Si, NPN	Q41230
R1	Resistor, Comp, 100K, 2W, 5%	R50104
R2	Resistor, Comp, 100K, 2W, 5%	R50104
R3	Resistor, Comp, 100K, 2W, 5%	R50104
R4	Resistor, Comp, 47K, 2W, 5%	R50473
R5	Resistor, Comp, 100K, 2W, 5%	R50104

REGULATOR/FILTER PC BD ASSY A5A1 (CONT.)

REF DESIG	DESCRIPTION	P/N
R6	Resistor, Comp, 33K, 2W, 5%	R50333
R9	Resistor, Comp, 3.3K, 1/4W, 5%	R20222
R10	Resistor, Comp, 4.7K, 1/4W, 5%	R20472
R11	Resistor, W.W., 1 ohm, 1.5W	R90001
R12	Resistor, W.W., 1 ohm, 1.5W	R90001
R13	Res, Comp, 220Ω, 1/4W, 5%	R20221
R14	Resistor, Comp, 1K, 1/4W, 5%	R20102
R15	Resistor, Var, Comp, 1K	R88102
R16	Resistor, Comp, 1K, 1/4W, 5%	R20102
R17	Resistor, Comp, 270, 1/4W, 5%	R20271
R18	Resistor, Comp, 270, 1/4W, 5%	R20271
VR1	Diode, Zener, 1N4745A, 15V, 1W	VR4745
VR2	Diode, Zener, 1N752, 5.6V, 400 MW	VR7520

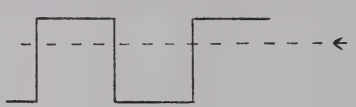
START CIRCUIT PC BD ASSY A5A2

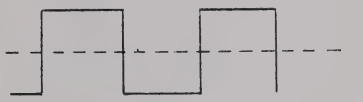
REF DESIG	DESCRIPTION	P/N
A5A2	Start Circuit PC Board Assembly	200470
C1	Capacitor, Elect, 10 μf, 20VDC	C41064
C2	Capacitor, Elect, 10 μf, 20 VDC	C41064
C3	Capacitor, Elect, 10 μf, 20 VDC	C41064
C4	Capacitor, Disc, Cer, .1 μf, 25 VDC	C11000
C5	Capacitor, Disc, Cer, .1 μf, 25 VDC	C11000
CR3	Diode, Si, 1N914	CR9140
Q1	Transistor, 2N5296, NPN	Q52960
Q2	Transistor, 2N4125, PNP	Q41250
Q3	Transistor, 2N4123, NPN	Q41230
R3	Resistor, Comp, 1K, 1/4W, 5%	R20102
R4	Resistor, Comp, 10 ohm, 1/2W, 13.6 VDC Unit	R30100
R4	Resistor, Comp, 22 ohm, 1/2W, 26 VDC Unit	R30220
R5	Resistor, Comp, 10 ohm, 1/2W, 13.6 VDC Unit	R30100
R5	Resistor, Comp, 22 ohm, 1/2W, 26 VDC Unit	R30220
R6	Resistor, Comp, 1K, 1/4W, 5%	R20102
R7	Resistor, Comp, 1K, 1/4W, 5%	R20102
R8	Resistor, Comp, 100 ohms, 1/2W, 5%	R30101
R9	Resistor, Comp, 5.6K, 1/4W, 5%	R20562
R10	Resistor, Comp, 1K, 1/4W, 5%	R20102
R11	Resistor, Comp, 10 ohm, 1/2W, 5%	R30100
R11	Resistor, Comp, 22 ohm, 1/2W, 5%, 26 VDC Unit	R30220
T1	Transformer, Timing, Torroid	T00103
VR1	Diode, Zener, 12V, 1W, 26 VDC Unit	VR4742

TABLE 12-1. VOLTAGE AND WAVEFORM CHART

NOTE

The following voltages and waveforms are obtained when the AR-260 DC-to-DC converter is connected to a battery voltage of 13.6 volts. All plugs and receptacles of the converter should be mated with corresponding receptacles of the radio, and the radio should be set to the RECEIVE mode.

TEST POINT LOCATION	VOLTAGE OR WAVEFORM	COMMENTS
J3 pin 1 (+) and pin 2 (-)	+13.6 Volts (Battery Voltage)	This voltage should only appear when the Transceiver is set to Receive or Transmit.
J2 pin 1 (+ HV) and pin 8 (common)	+750 ± 75 Vdc	WARNING: Dangerous high Voltage.
J2 pin 3 (-) to pin 8 (common)	-120 ± 20 Vdc	
J2 pin 2 (+) to pin 8 (common)	+240 ± 25 Vdc	WARNING: Dangerous high Voltage
J2 pin 4 (+) J2 pin 8 (common)	+12.5 ± .5 Vdc	This is the regulated dc output and should have less than 150 MV peak to peak ripple.
J2 pin 5 and 6 (+) to pin 7 (-)	+13.6 Volts (Battery Voltage)	This voltage is applied to Transceiver filaments.
Cathode of A1CR17 (-) to chassis ground.	-0.6 ± .3 Vdc	A positive indication at this point indicates the loss of the -120 Vdc bias supply.
Q1 or Q2; base to emitter	5 kHz square wave, 6 ± 1 Volts peak-to-peak 	-Battery voltage (DC reference)

TEST POINT LOCATION	VOLTAGE OR WAVEFORM	COMMENTS
Q1 or Q2; collector to emitter	5 kHz square wave, 20 ± 5 Volts peak-to-peak 	

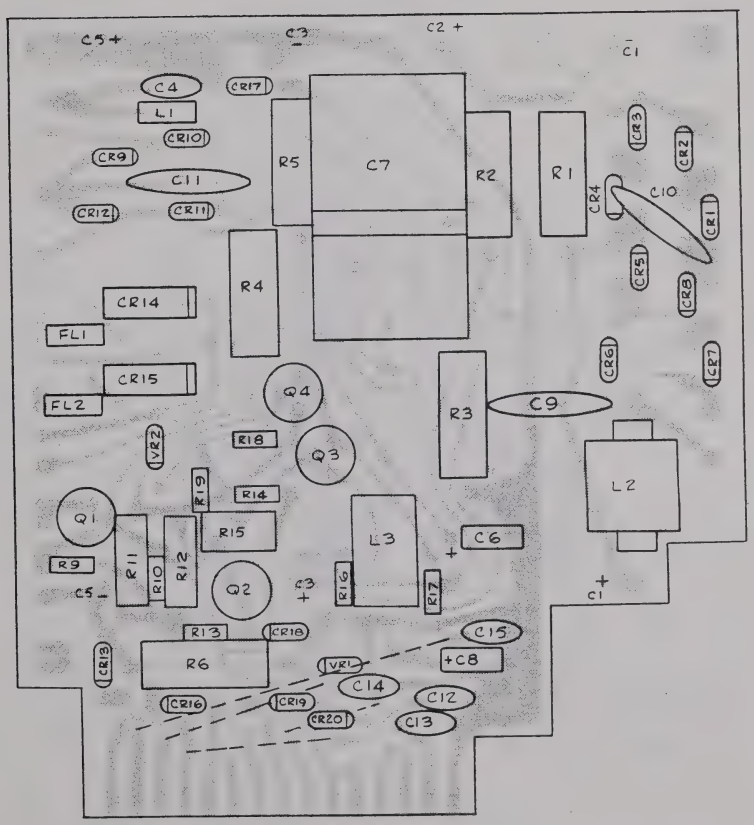


Figure 12-1. Regulator/Filter PC Board Assembly A5A1, Component Locations

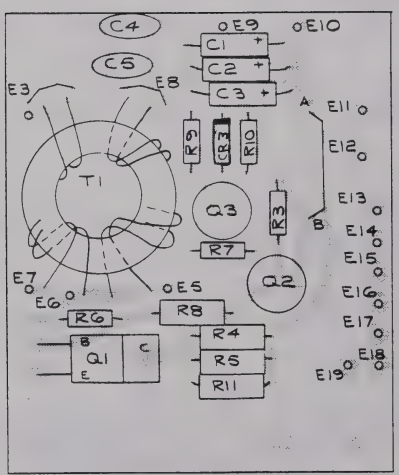


Figure 12-2. Starting Circuit PC Board Assembly A5A2, Component Locations

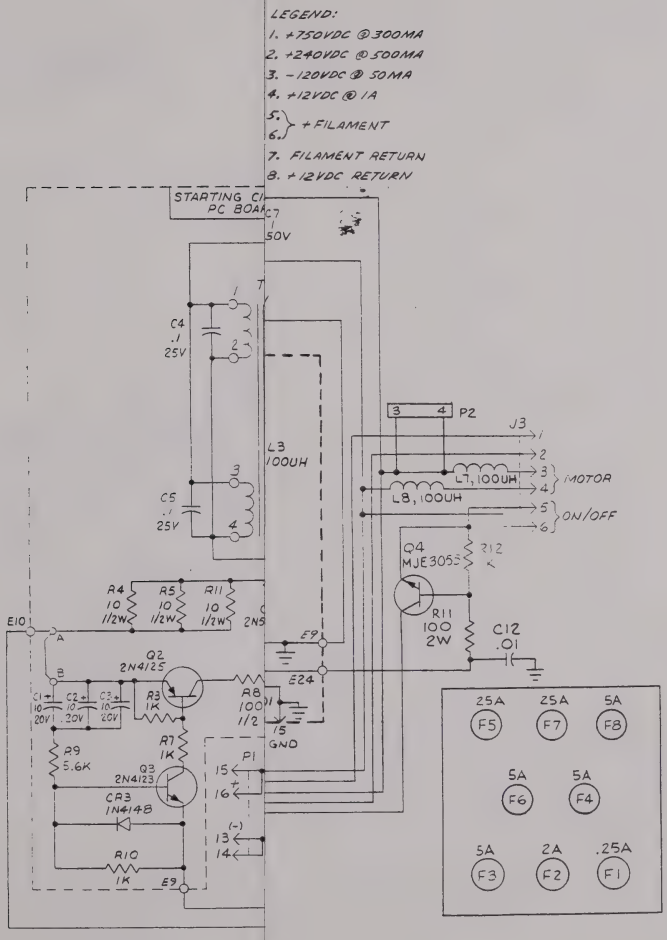


Figure 12-3. 12V DC Power Supply, Schematic Diagram

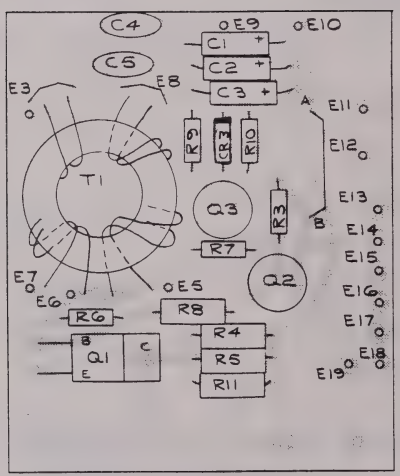


Figure 12-2. Starting Circuit PC Board Assembly A5A2, Component Locations

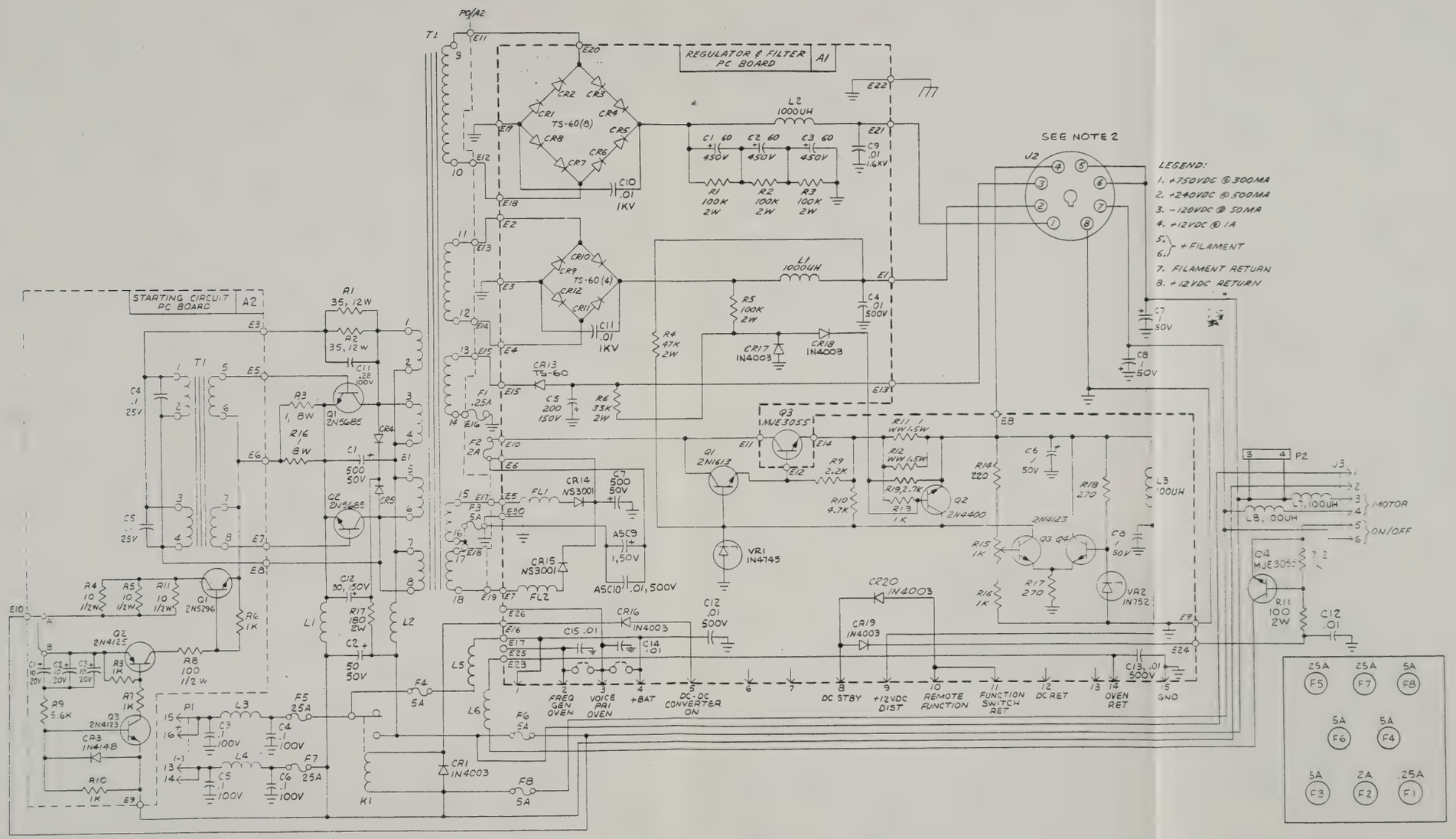


Figure 12-3. 12V DC Power Supply, Schematic Diagram

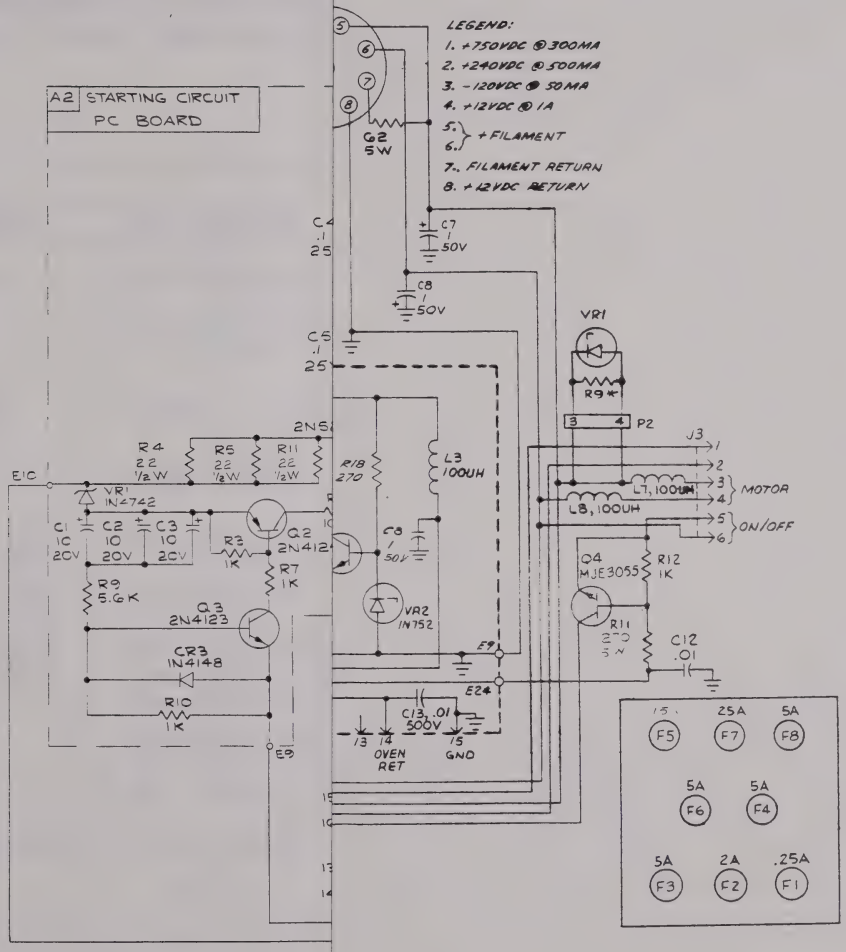


Figure 12-4. 24V DC Power Supply, Schematic Diagram

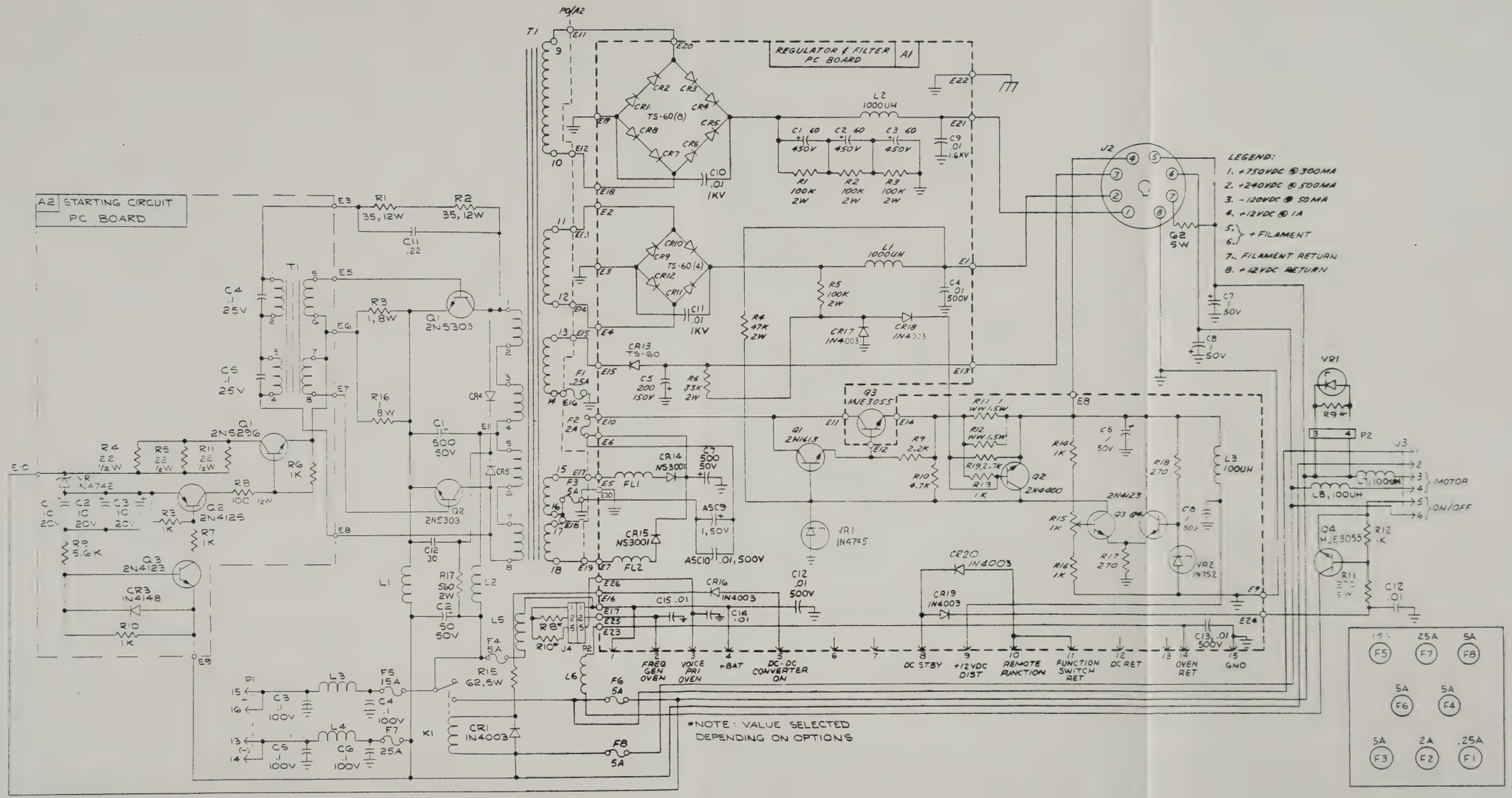


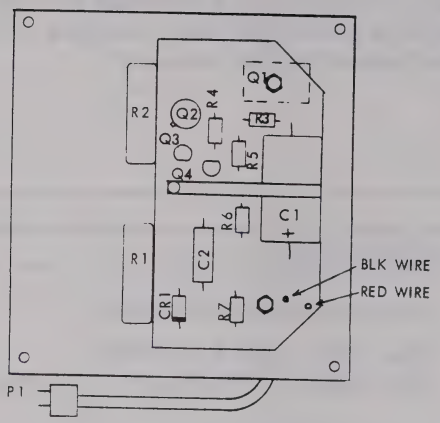
Figure 12-4. 24V DC Power Supply, Schematic Diagram

ADDENDUM

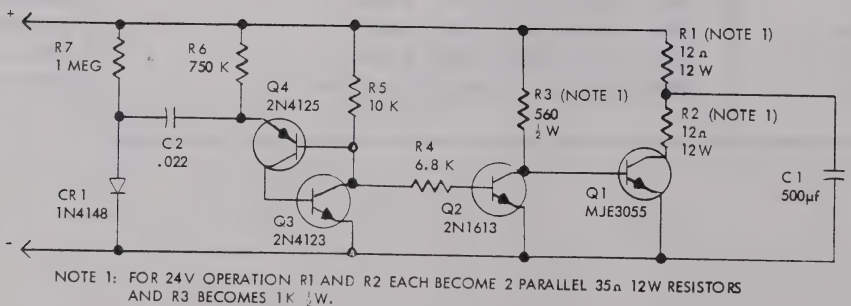
RFI SUPPRESSOR FOR SR-206/210 TRANSCEIVER

On dc operated sets without a fan option, the P/N 200454 RFI Suppressor is attached to the rear panel and plugged into J4 in place of the fan. Following are the parts list, parts location diagram, and schematic diagram for this assembly.

REF DESIG	DESCRIPTION	P/N
---	RFI SUPPRESSOR ASSEMBLY	200454
C1	Cap, elect, 500 μF, 50 Vdcw	C70003
C2	Cap, mylar, .022 μF, 10%, 100 Vdcw	C20022
CR1	Diode, si, signal, 1N4148	CR4148
P1	Plug, 4 pin	P00200
R1 (12V)	Res, ww, 12Ω, 12W	R90002
R1 (24V)	2 each, Res, ww, 35Ω, 12W	R90004
R2 (12V)	Res, ww, 12Ω, 12W	R90002
R2 (24V)	2 each, Res, ww, 35Ω, 12W	R90004
R3 (12V)	Res, comp, 560Ω, 5%, 1/2W	R30561
R3 (24V)	Res, comp, 1.0K, 5%, 1/2W	R30102
R4	Res, comp, 6.8K, 5%, 1/4W	R20682
R5	Res, comp, 10K, 5%, 1/4W	R20103
R6	Res, comp, 750K, 5%, 1/4W	R20754
R7	Res, comp, 1.0 meg, 5%, 1/4W	R20105



Component Locations



NOTE 1: FOR 24V OPERATION R1 AND R2 EACH BECOME 2 PARALLEL 35Ω 12W RESISTORS AND R3 BECOMES 1K ½W.

Schematic Diagram

CHAPTER 13
FREQUENCY GENERATOR ASSY A6

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Paragraph 13.2	Clarifier Module A6A11
Paragraph 13.3	Channel Oscillator Module
----------	Parts List
Figure 13-1	Channel Osc and Clarifier Boards
Figure 13-2	Frequency Generator Board
Figure 13-3	Frequency Generator Schematic

13.1 GENERAL.

There are three types of frequency generator assemblies: a simplex type A6 board, a duplex (or marine) type A6 board, and a duplex type A8 board. The A8 board provides the second frequency for any channel requiring independent transmit and receive frequencies. Since this manual is set up for non-marine Transceivers, only the simplex type A6 version is documented here.

The Frequency Generator Assembly, shown schematically in Figure 13-3 and pictorially in Figure 13-2, provides all injection frequencies necessary for transceiver operation. Q2 and Q4 are the usb and lsb carrier oscillators and are activated depending on mode. The two separate oscillators are gated by Q3 and Q5. Q6 is the output driver to the IF/Audio Module. CR5-CR6 and CR15-CR16 provide internal agc control of level. R15 and R24 equalize level output. R30 adjusts output level.

In am transmit, am equivalent is used rather than true am; i.e., carrier plus only one sideband. The usb carrier oscillator is on in am. However, am receive is true envelope detection. To prevent detection from occurring, Q2 is turned off in receive only by CR4. The output of second local oscillator, Q9, is buffered by driver Q10. Usb and lsb crystal selection is provided by gates Q7 and Q8. R46 adjusts output level.

13.2 CLARIFIER MODULE A6A11.

The Clarifier Module, shown in Figure 13-3, operates in conjunction with second oscillator Q9. By appropriate usb/lsb selection with Q2 and Q3, varicap diodes CR2 and CR9 are placed in series with the crystals and allow, through front panel control, a range of ± 150 Hz to be tuned on the second lo injection frequency. This permits operation with stations off frequency. The clarifier is normally enabled in receive only. Q1 is the gate which enables the clarifier.

13.3 CHANNEL OSCILLATOR MODULE.

Each channel oscillator, A6A1 through A6A10, shown schematically in Figure 13-3, is a separate module dc-controlled by the channel selector switch. Four bands cover the oscillator range of 3.1 to 31.5 MHz. Channel frequency bands are:

1.6-3.5 MHz Low Band A
3.5-12.0 MHz Low Band B
12.0-18.0 MHz High Band A
18.0-30.0 MHz High Band B

Channel frequency is set by C1, available from the side without module removal. All oscillators are sampled across a common load, R1 and R2, and amplified by driver Q1. R4 adjusts output level on all channels.

REF DESIG	DESCRIPTION	P/N
---	FREQUENCY GENERATOR PC BOARD ASSY	
	6 channel	200500-6
	10 channel	200500-10
A6A1	Channel Oscillator PC Board, as listed below:	
thru	1.6-3.5 MHz	200580-1
A6A10	3.5-12.0 MHz	200580-2
	12.0-18.0 MHz	200580-3
	18.0-30.0 MHz	200580-4
A6A11	Clarifier PC Board (option)	200560
C1	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C2	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C3	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C4	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C5	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C6	Cap, mica, 6pF, 5%, 500 Vdcw	C05060
C7	Cap, air, var, 2.2-34.0pF	C60001
C8	Cap, mica, 2000pF, 5%, 500 Vdcw	C06202
C9	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C10	Cap, mica, 220pF, 5%, 500 Vdcw	C05221
C11	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C12	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C13	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C14	Cap, cer, 0.1μF, +80-20%, 25 Vdcw	C11000
C15	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C16	Cap, mica, 6pF, 5%, 500 Vdcw	C05060
C17	Cap, air, var, 2.2-34.0pF	C60001
C18	Cap, mica, 2000pF, 5%, 500 Vdcw	C06202
C19	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C20	Cap, mica, 220pF, 5%, 500 Vdcw	C05221
C21	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C22	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C23	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C24	Cap, mica, 390pF, 5%, 500 Vdcw	C05391
C25	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C26	Cap, air, var, 2.2-34.0pF	C60001
C27	Cap, mica, 18pF, 5%, 500 Vdcw	C05180
C28	Not used	---
C29	Not used	---
C30	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C31	Cap, cer, .01μF, 20%, 500 Vdcw	C10100

FREQUENCY GENERATOR PC BD ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
C32	Cap, mica, 18pF, 5%, 500 Vdcw	C05180
C33	Cap, air, var, 2.2-34pF	C60001
C34	Not used	---
C35	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C36	Cap, mica, 470pF, 5%, 500 Vdcw	C06471
C37	Cap, mica, 1000pF, 5%, 500 Vdcw	C06102
C38	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C39	Cap, mica, 220pF, 5%, 500 Vdcw	C05221
C40	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C41	Cap, mica, ___pF, 5%, 500 Vdcw	
	(1.5 MHz IF: 100pF)	C05101
	(1.4 MHz IF: 110pF)	C05111
CR1	Diode, si, signal, 1N4148	CR4148
CR2	Diode, si, signal, 1N4148	CR4148
CR3	Not used	---
CR4	Diode, si, signal, 1N4148	CR4148
CR5	Diode, si, signal, 1N4148	CR4148
CR6	Diode, si, signal, 1N4148	CR4148
CR7	Diode, si, signal, 1N4148	CR4148
CR8	Diode, si, signal, 1N4148	CR4148
CR9	Diode, si, signal, 1N4148	CR4148
CR10	Not used	---
CR11	Not used	---
CR12	Diode, si, signal, 1N4148	CR4148
CR13	Diode, si, signal, 1N4148	CR4148
CR14	Not used	---
CR15	Diode, si, signal, 1N4148	CR4148
CR16	Diode, si, signal, 1N4148	CR4148
CR17	Diode, si, signal, 1N4148	CR4148
CR18	Diode, si, signal, 1N4148	CR4148
CR19	Not used	---
CR20	Not used	---
CR21	Diode, si, signal, 1N4148	CR4148
CR22	Diode, si, signal, 1N4148	CR4148
CR23	Diode, si, signal, 1N4148	CR4148
CR24	Diode, si, signal, 1N4148	CR4148
HR1	Oven, crystal, as listed below:	
	6 channel thermostat: snap-action	HR1001
	10 channel thermostat: snap-action	HR1002
L1	Choke, rf, 1 mH	L10102
L2	Choke, rf, 330μH	L10331
L3	Choke, rf, 75μH	L10750
L4	Choke, rf, 1 mH	L10102
L5	Choke, rf, 100μH	L10101

FREQUENCY GENERATOR PC BD ASSY (CONT.)

REF DESIG	DESCRIPTION	P/N
L6	Choke, rf, 180μH	L10181
L7	Choke, rf, 180μH	L10181
Q1	Transistor, npn, 2N5179	Q51790
Q2	Transistor, npn, 2N4123	Q41230
Q3	Transistor, npn, 2N4123	Q41230
Q4	Transistor, npn, 2N4123	Q41230
Q5	Transistor, npn, 2N4123	Q41230
Q6	Transistor, npn, 2N4123	Q41230
Q7	Transistor, npn, 2N4123	Q41230
Q8	Transistor, npn, 2N4123	Q41230
Q9	Transistor, npn, 2N5179	Q51790
Q10	Transistor, npn, 2N4123	Q41230
R1	Res, comp, 10Ω, 5%, 1/4W	R20100
R2	Res, comp, 100Ω, 5%, 1/4W	R20101
R3	Res, comp, 100Ω, 5%, 1/4W	R20101
R4	Pot, trim, pc, 100Ω	R88101
R5	Res, comp, 330Ω, 5%, 1/4W	R20331
R6	Res, comp, 12K, 5%, 1/4W	R20123
R7	Res, comp, 10K, 5%, 1/4W	R20103
R8	Res, comp, 100Ω, 5%, 1/4W	R20101
R9	Res, comp, 27Ω, 5%, 1/4W	R20270
R10	Res, comp, 1K, 5%, 1/4W	R20102
R11	Res, comp, 15K, 5%, 1/4W	R20153
R12	Res, comp, 10K, 5%, 1/4W	R20103
R13	Res, comp, 150K, 5%, 1/4W	R20154
R14	Res, comp, 4.7K, 5%, 1/4W	R20472
R15	Pot, trim, pc, min, 5K	R89502
R16	Res, comp, 10K, 5%, 1/4W	R20103
R17	Res, comp, 10K, 5%, 1/4W	R20103
R18	Res, comp, 1K, 5%, 1/4W	R20102
R19	Res, comp, 100Ω, 5%, 1/4W	R20101
R20	Res, comp, 15K, 5%, 1/4W	R20153
R21	Res, comp, 10K, 5%, 1/4W	R20103
R22	Res, comp, 150K, 5%, 1/4W	R20154
R23	Res, comp, 4.7K, 5%, 1/4W	R20472
R24	Pot, trim, pc, min, 5K	R89502
R25	Res, comp, 10K, 5%, 1/4W	R20103
R26	Res, comp, 10K, 5%, 1/4W	R20103
R27	Not used	---
R28	Res, comp, 560Ω, 5%, 1/4W	R20561
R29	Res, comp, 27Ω, 5%, 1/4W	R20270
R30	Pot, trim, pc, 1K	R88102
R31	Res, comp, 1.8K, 5%, 1/4W	R20182
R32	Res, comp, 820Ω, 5%, 1/4W	R20821
R33	Res, comp, 150Ω, 5%, 1/4W	R20151

FREQUENCY GENERATOR PC BD ASSY (CONT.)

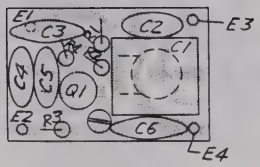
REF DESIG	DESCRIPTION	P/N
R34	Res, comp, 10K, 5%, 1/4W	R20103
R35	Res, comp, 6.8K, 5%, 1/4W	R20682
R36	Res, comp, 6.8K, 5%, 1/4W	R20682
R37	Res, comp, 10K, 5%, 1/4W	R20103
R38	Res, comp, 82K, 5%, 1/4W	R20823
R39	Res, comp, 82K, 5%, 1/4W	R20823
R40	Res, comp, 33K, 5%, 1/4W	R20333
R41	Res, comp, 100Ω, 5%, 1/4W	R20101
R42	Res, comp, 22K, 5%, 1/4W	R20223
R43	Res, comp, 1.2K, 5%, 1/4W	R20122
R44	Res, comp, 100Ω, 5%, 1/4W	R20101
R45	Res, comp, 470Ω, 5%, 1/4W	R20471
R46	Pot, trim, pc, 5K	R88502
R47	Res, comp, 100Ω, 5%, 1/4W	R20101
T1	Transformer, 2-30 MHz, broadband	T10200
Y1	Crystal, usb, carrier	Y101XX**
Y2	Crystal, lsb, carrier	Y101XX
Y3	Crystal, usb, 2nd lo	Y103XX**
Y4	Crystal, lsb, 2nd lo	Y103XX
Y5	Crystal, channel	Y20001***
Y6	Crystal, channel	Y20001***
Y7	Crystal, channel	Y20001***
Y8	Crystal, channel	Y20001***
Y9	Crystal, channel	Y20001***
Y10	Crystal, channel	Y20001***
Y11	Crystal, channel	Y20001***
Y12	Crystal, channel	Y20001***
Y13	Crystal, channel	Y20001***
Y14	Crystal, channel	Y20001***
	**Frequency Assignment per channel frequency requirement. When ordering, specify <u>all</u> channel <u>carrier</u> frequencies being used. Refer to table 4-2.	
	***Frequency is specified as desired channel carrier frequency + IF FREQ (MHz). Example: SSB, USB apparent carrier or AM true carrier frequency of 4.00000 MHz equals <u>CHANNEL CRYSTAL FREQUENCY</u> of 4.00000 + 1.500000 or 5.500000 MHz. (+ 1.400000 for 1.4 MHz IF.) When ordering new channel crystals specify whether you are ordering CHANNEL <u>CRYSTAL</u> FREQUENCY <u>OR</u> CHANNEL <u>CARRIER</u> FREQUENCY	

CHANNEL OSCILLATOR PC BOARD A1-A10

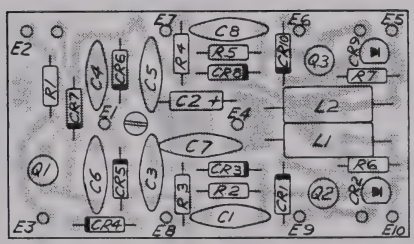
REF DESIG	DESCRIPTION	SRS P/N
---	CHANNEL OSCILLATOR PC BOARD, as listed below:	
	1.6-3.5 MHz	200580-1
	3.5-12.0 MHz	200580-2
	12.0-18.0 MHz	200580-3
	18.0-30.0 MHz	200580-4
C1	Cap, as listed below:	
	1.6-3.5 MHz: air, var, 2.2-34pF	C60001
	3.5-12.0 MHz: air, var, 2.2-34pF	C60001
	12.0-18.0 MHz: air, var, 2.2-34pF	C60001
	18.0-30.0 MHz: piston, var, 1-20pF	C61002
C2	Cap, mica, 18pF, 5%, 500 Vdcw	C05180
C3	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C4	Cap, mica, ___pF, 5%, 500 Vdcw, as listed below:	
	1.6-3.5 MHz: 390pF	C05391
	3.5-12.0 MHz: 270pF	C05271
	12.0-18.0 MHz: 270pF	C05271
	18.0-30.0 MHz: 180pF	C05181
C5	Cap, mica, ___pF, 5%, 500 Vdcw, as listed below:	
	1.6-3.5 MHz: 220pF	C05221
	3.5-12.0 MHz: 100pF	C05101
	12.0-18.0 MHz: 100pF	C05101
	18.0-30.0 MHz: 100pF	C05101
C6	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
MP1	Screw, nylon, 2-56 x 3/8	H4206A
MP2	Nut, nylon, 2-56	H42000
Q1	Transistor, npn, 2N4123 (1.6-3.5 MHz)	Q41230
	OR Transistor, npn, 2N5179 (3.5-30 MHz)	Q51790
R1	Res, comp, 10K, 5%, 1/4W	R20103
R2	Res, comp, 15K, 5%, 1/4W	R20153
R3	Res, comp, 47Ω, 5%, 1/4W	R20470
R4	Res, comp, 1.2K, 5%, 1/4W	R20122

CLARIFIER PC BOARD ASSEMBLY A11

REF DESIG	DESCRIPTION	SRS P/N
---	CLARIFIER PC BOARD ASSEMBLY	200560
	with: Front Panel Control Pot, w/switch	R87502
	Control Knob	MP0402
	Front Panel Label	200122-2
C1	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C2	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C3	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C4	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C5	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C6	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C7	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C8	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
CR1	Diode, si, signal, 1N4148	CR4148
CR2	Varicap, MV2107	CR0100
CR3	Diode, si, signal, 1N4148	CR4148
CR4	Diode, si, signal, 1N4148	CR4148
CR5	Diode, si, signal, 1N4148	CR4148
CR6	Diode, si, signal, 1N4148	CR4148
CR7	Diode, si, signal, 1N4148	CR4148
CR8	Diode, si, signal, 1N4148	CR4148
CR9	Varicap, MV2107	CR0100
CR10	Diode, si, signal, 1N4148	CR4148
L1	Choke, rf, 10 mH	L10103
L2	Choke, rf, 10 mH	L10103
MP1	Screw, nylon, 2-56 x 3/8	H4206A
MP2	Nut, nylon, 2-56	H42000
Q1	Transistor, npn, 2N4123	Q41230
Q2	Transistor, npn, 2N4123	Q41230
Q3	Transistor, npn, 2N4123	Q41230
R1	Res, comp, 10K, 5%, 1/4W	R20103
R2	Res, comp, 10K, 5%, 1/4W	R20103
R3	Res, comp, 6.8K, 5%, 1/4W	R20682
R4	Res, comp, 6.8K, 5%, 1/4W	R20682
R5	Res, comp, 10K, 5%, 1/4W	R20103
R6	Res, comp, 470K, 5%, 1/4W	R20474
R7	Res, comp, 470K, 5%, 1/4W	R20474



Channel
Oscillator
Module



Clarifier Option

Figure 13-1 Channel Oscillator Boards
A6A1-A6A10 and Clarifier Board A6A11

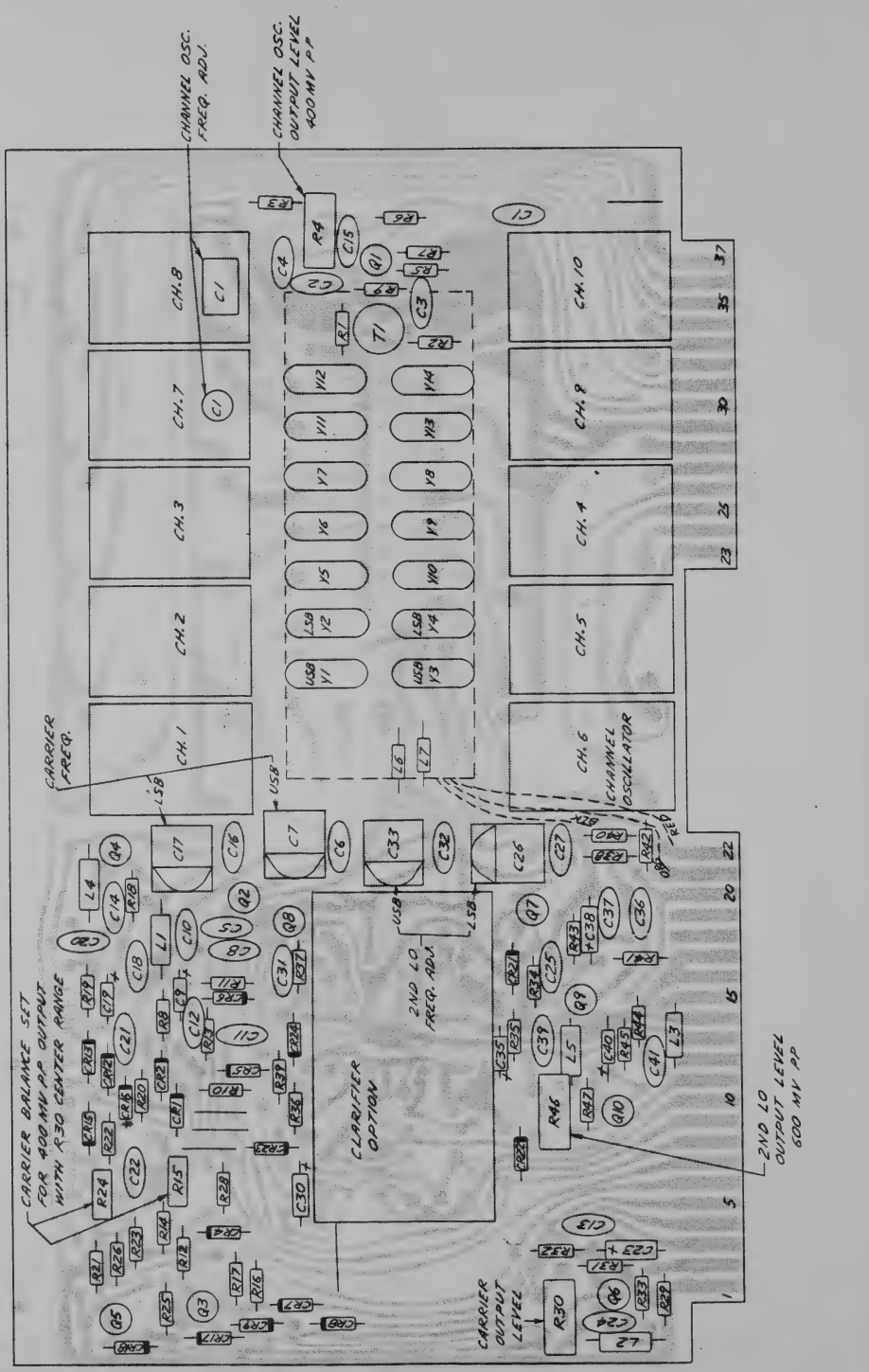
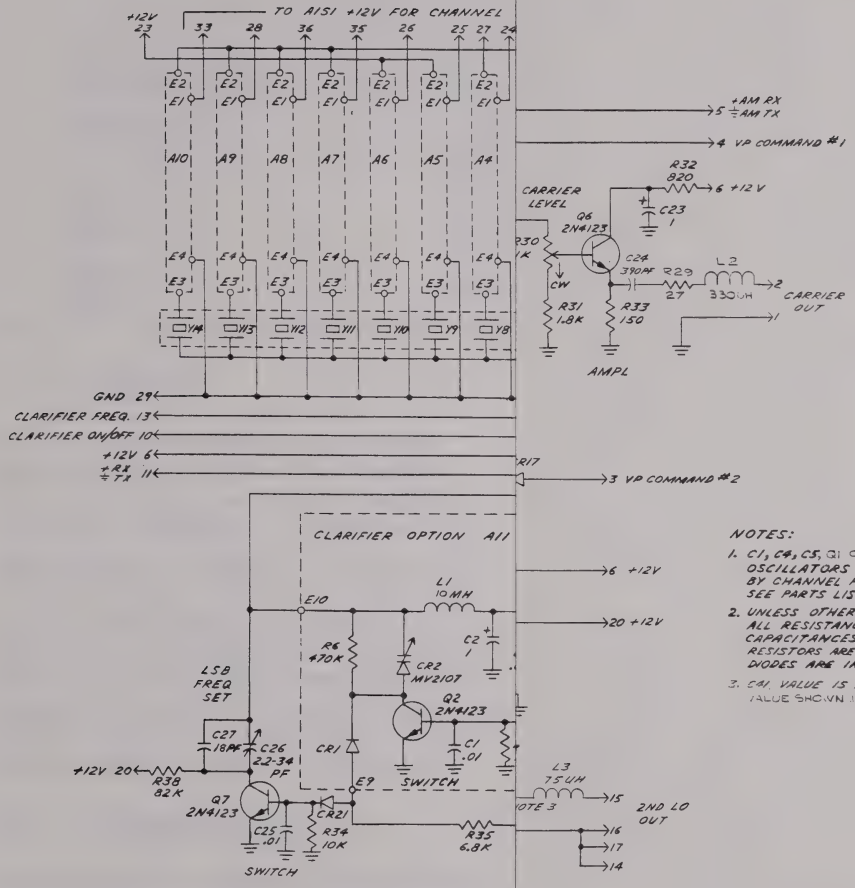


Figure 13-2. Frequency Generator Board A6



NOTES:

1. C1, C4, C5, Q1 ON CHANNEL OSCILLATORS DETERMINED BY CHANNEL FREQUENCY, SEE PARTS LIST.
2. UNLESS OTHERWISE SPECIFIED ALL RESISTANCES IN OHMS CAPACITANCES IN MICROFARADS RESISTORS ARE 1/4 WATT 5% CARBON DIODES ARE 1N4148
3. C41 VALUE IS 110 PF FOR 1.4 MHZ IF, VALUE SHOWN IS FOR 1.5 MHZ IF.

Figure 13-3. Frequency Generator PC Board (Simplex), Schematic Diagram

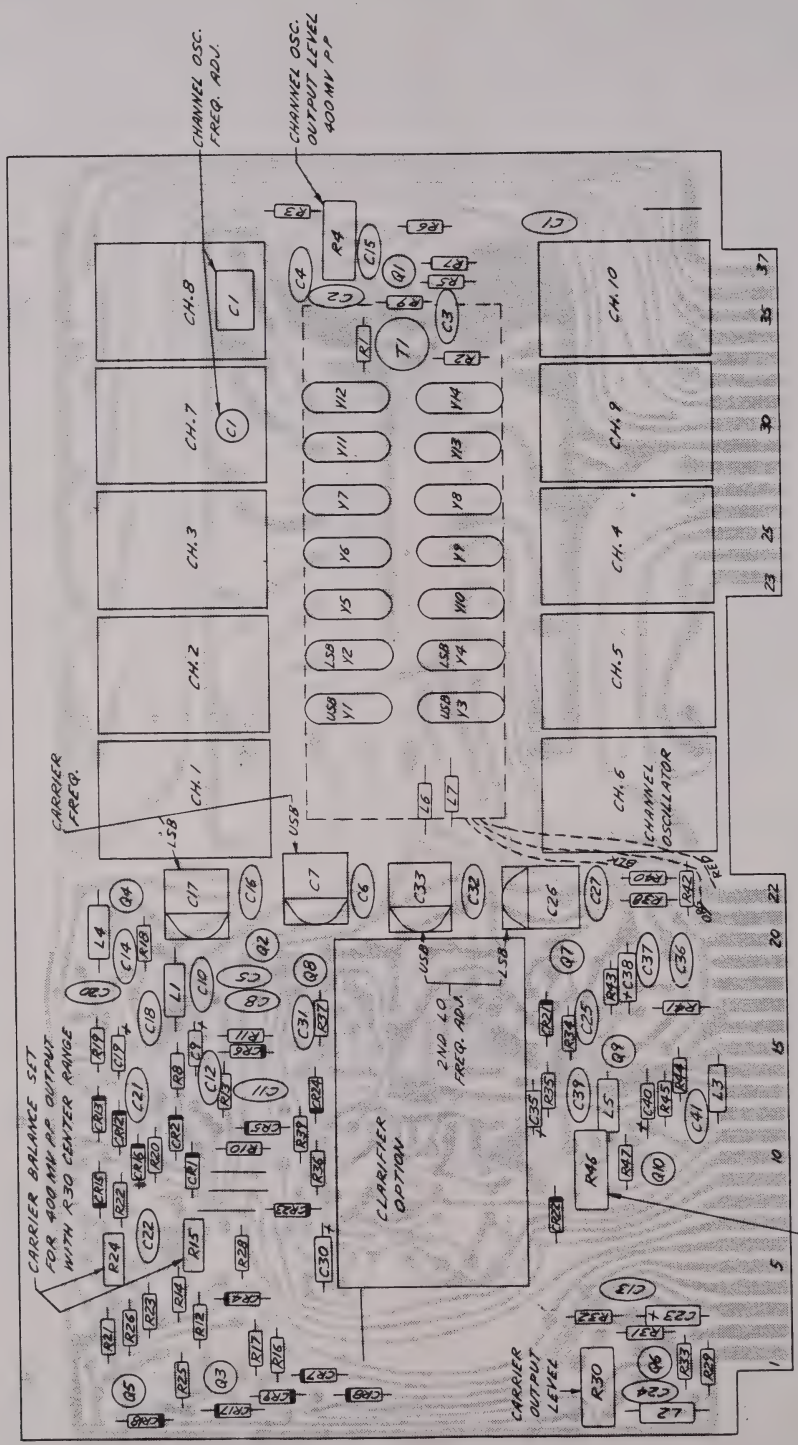


Figure 13-2. Frequency Generator Board A6

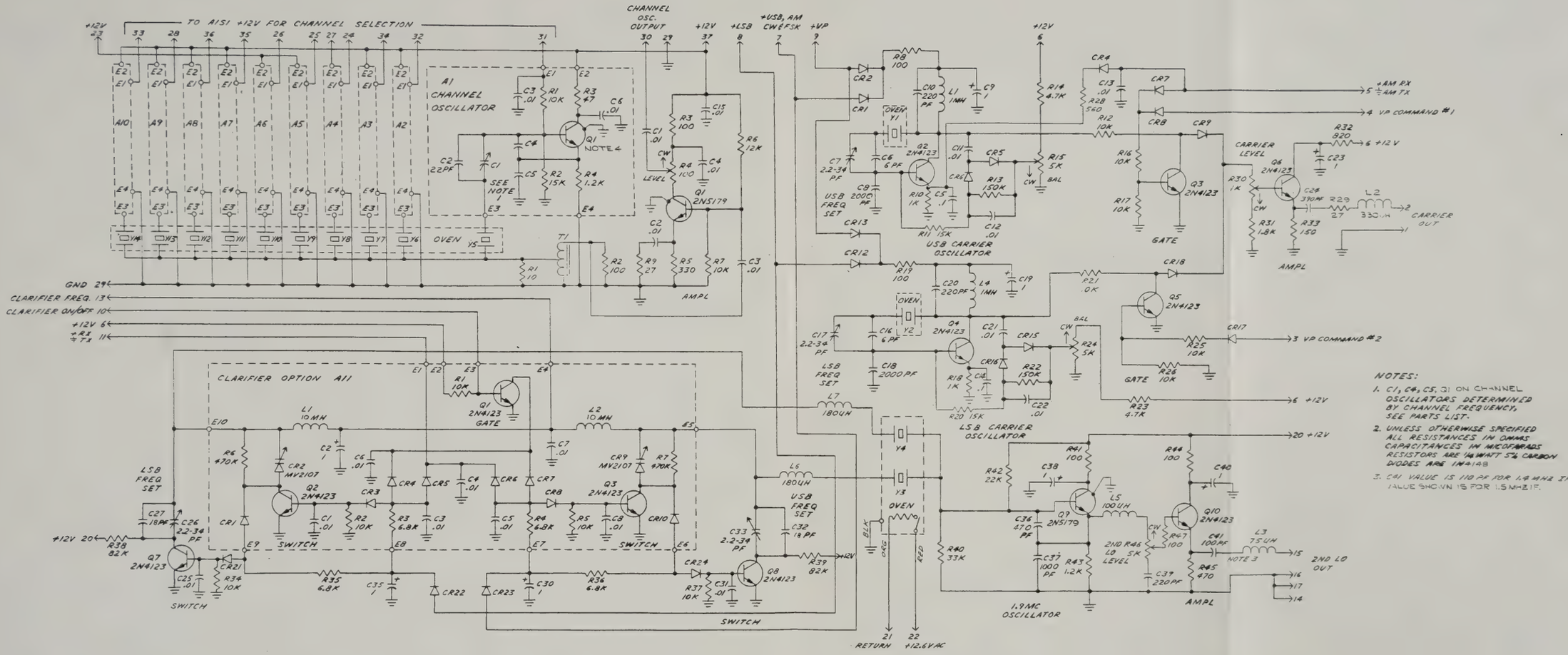


Figure 13-3. Frequency Generator PC Board (Simplex), Schematic Diagram

CHAPTER 14
BASIC OPTIONS

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Figure 14-3	VOX Schematic
Figure 14-4	Squelch Schematic

14.1 GENERAL.

The Basic Option Board, A7, is shown schematically on Figures 14-2 through 14-4. The options are plug-in and may be used in any combination. No further system changes are necessary to incorporate any or all of the options. All that is required is the plugging in of option board into XA7 on the Signal Distribution Motherboard. All front panel wiring information is given on the Main Frame schematic diagram in Chapter 6. Assembly information for all modules is given in Figure 14-1.

14.2 CW MODULE A7A1.

The CW Module consists of 1 kHz R-C oscillator Q1-Q4 followed by amplifier-driver Q5-Q7. Keying is supplied to the keyline and Q9 with R9, R10, providing pulse shaping to eliminate key clicks. Q8 acts as a switch, which begins oscillation by shorting R8 to ground. The transmit tone level is controlled by the front panel transmit audio control. Receive volume is set by R20 and also the front panel receive audio control.

14.3 VOX MODULE A7A2.

The function of the VOX option is to eliminate the necessity of manually keying the transmitter during voice operation. Refer to schematic, Figure 14-3.

Q1 and Q2 form a bandpass amplifier having a maximum response between 400 and 800 Hz, the frequency range over which the majority of voice energy exists in sideband communications. Voice signals are detected by CR2 and drive switch Q3, discharging timing capacitor C8. VOX threshold is established by a front panel control supplying bias to the emitter of Q8.

Each voice pulse discharges C8, thereby shorting the keyline. Charging rate is determined by R11 and the beta of Q4. In the absence of voice, C8 will charge until Q4 cuts off (adjustable from 0.1 to 1 sec by R11), turning off Q5 which deactivates the keyline.

Front panel control R4 provides threshold control with maximum ccw being off (push-

to-talk). Cw position of the control gives maximum sensitivity; ccw minimum. In the maximum cw position, all input signals will key the transmitter.

An antivox circuit, Q6 and Q7, is also incorporated. Adjustment of R15 desensitizes the VOX action in the presence of microphone feedback from the internal speaker.

14.4 SQUELCH MODULE A7A4.

The function of the squelch option is to eliminate the necessity of listening to noise in the absence of a desired signal. Refer to schematic diagram, Figure 14-4.

Q1 and Q2 form a bandpass amplifier having a maximum response between 400 and 800 Hz, the frequency range over which the majority of voice energy exists in sideband communications. Voice signals are detected by CR2 and drive switch Q3 discharging timing capacitor C8. Squelch threshold is established by a front panel control supplying bias to the emitter of Q3.

Each voice pulse discharges C8. Charging rate is determined by R11 and the beta of Q4. In the absence of voice, C8 will charge until VR1 fires (approximately 1 sec), turning on Q5 and Q6, which activate squelch transistor Q7. The audio output signal in the absence of voice is therefore shunted to ground. Squelched audio is suppressed 20 dB.

Front panel control R3 provides threshold control with maximum ccw being off. Cw position of the control gives maximum sensitivity; ccw minimum. In the maximum cw position all noise signals will unsquelch the receiver.

BASIC OPTION PC BOARD ASSY

REF DESIG	DESCRIPTION	SRS P/N
---	BASIC OPTION PC BOARD ASSEMBLY	200600
A1	CW PC Board Assembly	200660
	with: Front Panel Control Potentiometer*	R88502
	Control Knob*	MP0402
	Front Panel Label*	200122-7
A2	VOX PC Board Assembly	200670
	with: Front Panel Control Pot w/switch	R87502
	Control Knob	MP0402
	Front Panel Label	200122-4
A3	Special Option	---
A4	Squelch PC Board Assembly	200690
	with: Front Panel Control Pot w/switch	R87502
	Control Knob	MP0402
	Front Panel Label	200122-1
	Diode, si, signal, 1N4148	CR4148

*TR Delay Only

CW PC BOARD ASSEMBLY A1

REF DESIG	DESCRIPTION	SRS P/N
---	CW PC BOARD ASSEMBLY	200660
C1	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C2	Cap, mica, 1000pF, 5%, 500 Vdcw	C06102
C3	Cap, mica, 1000pF, 5%, 500 Vdcw	C06102
C4	Cap, mica, 2000pF, 5%, 500 Vdcw	C06202
C5	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C6	Cap, tant, 10μF, 10%, 20 Vdcw	C41064
C7	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C8*	Cap, tant, 5.6μF, 10%, 35 Vdcw	C45656
C9	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C10*	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
CR1	Diode, si, signal, 1N4148	CR4148
CR2*	Diode, si, signal, 1N4148	CR4148
CR3	Diode, si, signal, 1N4148	CR4148
MP1	(2) Screw, nylon, 2-56 x 3/8	H4206A
MP2	(2) Nut, nylon, 2-56	H42000
Q1	Transistor, pnp, 2N4125	Q41250
Q2	Transistor, npn, 2N4123	Q41230
Q3	Transistor, npn, 2N4123	Q41230
Q4	Transistor, npn, 2N4123	Q41230
Q5	Transistor, npn, 2N4123	Q41230
Q6	Transistor, pnp, 2N4125	Q41250
Q7	Transistor, npn, 2N4123	Q41230
Q8	Transistor, npn, 2N4123	Q41230
Q9	Transistor, pnp, 2N4125	Q41250
Q10*	Transistor, pnp, 2N4125	Q41250
Q11*	Transistor, npn, 2N4123	Q41230
R1	Res, comp, 12K, 5%, 1/4W	R20123
R2	Res, comp, 33K, 5%, 1/4W	R20333
R3	Res, comp, 1K, 5%, 1/4W	R20102
R4	Res, comp, 22K, 5%, 1/4W	R20223
R5	Res, comp, 56K, 5%, 1/4W	R20563
R6	Res, comp, 180K, 5%, 1/4W	R20184
R7	Res, comp, 180K, 5%, 1/4W	R20184
R8	Res, comp, 68K, 5%, 1/4W	R20683
R9	Res, comp, 10K, 5%, 1/4W	R20103
R10	Res, comp, 22K, 5%, 1/4W	R20223
R11	Res, comp, 4.7K, 5%, 1/4W	R20472
R12	Res, comp, 4.7K, 5%, 1/4W	R20472
R13	Res, comp, 4.7K, 5%, 1/4W	R20472
R14	Res, comp, 2.2K, 5%, 1/4W	R20222
R15	Res, comp, 3.3K, 5%, 1/4W	R20332

*Parts marked with an asterisk are for TR Relay option, not normally supplied with CW.

CW PC BOARD ASSEMBLY A1 (CONT.)

REF DESIG	DESCRIPTION	SRS P/N
R16	Res, comp, 10K, 5%, 1/4W	R20103
R17	Res, comp, 470Ω, 5%, 1/4W	R20471
R18	Res, comp, 1K, 5%, 1/4W	R20102
R19	Res, comp, 2.2K, 5%, 1/4W	R20222
R20	Pot, trim, pc, min, 10K	R89103
R21	Res, comp, 4.7K, 5%, 1/4W	R20472
R22*	Res, comp, 5.6K, 5%, 1/4W	R20562
R23*	Res, comp, 470Ω, 5%, 1/4W	R20471
R24*	Res, comp, 10K, 5%, 1/4W	R20103
R25*	Res, comp, 100Ω, 5%, 1/4W	R20101
R26	Res, comp, 10K, 5%, 1/4W	R20103
R27*	Pot, trim, pc, 5K	R88502

*Parts marked with an asterisk are for TR Relay option, not normally supplied with CW.

VOX PC BOARD ASSY A2

REF DESIG	DESCRIPTION	SRS P/N
---	VOX PC BOARD ASSEMBLY	200670
C1	Cap, tant, 10μF, 10%, 20 Vdcw	C41064
C2	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C3	Cap, mylar, 0.22μF, 10%, 100 Vdcw	C20220
C4	Cap, mylar, .047μF, 10%, 100 Vdcw	C20047
C5	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C6	Cap, tant, 22μF, 10%, 15 Vdcw	C42263
C7	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C8	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C9	Not used	---
C10	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C11	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C12	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C13	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C14	Cap, cer, .001μF, 10%, 500 Vdcw	C10010
CR1	Diode, si, signal, 1N4148	CR4148
CR2	Diode, si, signal, 1N4148	CR4148
CR3	Diode, si, signal, 1N4148	CR4148
CR4	Not used	---
CR5	Diode, si, signal, 1N4148	CR4148
CR6	Diode, si, signal, 1N4148	CR4148
CR7	Diode, si, signal, 1N4148	CR4148
CR8	Diode, si, signal, 1N4148	CR4148
L1	Choke, rf, 750μH	L10751
MP1	(2) Screw, nylon, 2-56 x 3/8	H4206A
MP2	(2) Nut, nylon, 2-56	H42000
Q1	Transistor, npn, 2N4123	Q41230
Q2	Transistor, pnp, 2N4125	Q41250
Q3	Transistor, npn, 2N4123	Q41230
Q4	Transistor, pnp, 2N4125	Q41250
Q5	Transistor, npn, 2N4123	Q41230
Q6	Transistor, npn, 2N4123	Q41230
Q7	Transistor, npn, 2N4123	Q41230
Q8	Transistor, npn, 2N4123	Q41230
R1	Res, comp, 22K, 5%, 1/4W	R20223
R2	Res, comp, 2.2K, 5%, 1/4W	R20222
R3	Res, comp, 560Ω, 5%, 1/4W	R20561
R4	Res, comp, 470Ω, 5%, 1/4W	R20471
R5	Res, comp, 4.7K, 5%, 1/4W	R20472
R6	Res, comp, 1K, 5%, 1/4W	R20102
R7	Res, comp, 560Ω, 5%, 1/4W	R20561

VOX PC BOARD ASSY A2 (CONT.)

REF DESIG	DESCRIPTION	SRS P/N
R8	Res, comp, 470Ω, 5%, 1/4W	R20471
R9	Not used	---
R10	Res, comp, 1K, 5%, 1/4W	R20102
R11	Pot, trim, pc, min, 10K	R89103
R12	Res, comp, 10Ω, 5%, 1/4W	R20100
R13	Res, comp, 10K, 5%, 1/4W	R20103
R14	Res, comp, 27K, 5%, 1/4W	R20273
R15	Pot, trim, pc, min, 5K	R89502
R16	Res, comp, 4.7K, 5%, 1/4W	R20472
R17	Res, comp, 100Ω, 5%, 1/4W	R20101
R18	Res, comp, 1 meg, 5%, 1/4W	R20105
R19	Res, comp, 1K, 5%, 1/4W	R20102
R20*	Pot, trim, pc, 5K	R88502
R21	Res, comp, 10K, 5%, 1/4W	R20103
VR1	Diode, zener, 6.8V, 5%, 400 mW, 1N754A	VR7540

*Used in absence of front panel control.

SQUELCH PC BOARD ASSY A4

REF DESIG	DESCRIPTION	SRS P/N
---	SQUELCH PC BOARD ASSEMBLY	200690
C1	Cap, tant, 10μF, 10%, 20 Vdcw	C41064
C2	Not used	---
C3	Cap, mylar, 0.22μF, 10%, 100 Vdcw	C20220
C4	Cap, mylar, 0.047μF, 10%, 100 Vdcw	C20047
C5	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C6	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C7	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C8	Cap, tant, 5.6μF, 10%, 35 Vdcw	C45656
C9	Cap, tant, 1.0μF, 10%, 35 Vdcw	C41056
C10	Cap, tant, 100μF, 20%, 10 Vdcw	C41072
C11	Cap, cer, .01μF, 20%, 500 Vdcw	C10100
C12	Cap, tant, 10μF, 10%, 20 Vdcw	C41064
CR1	Diode, si, signal, 1N4148	CR4148
CR2	Diode, si, signal, 1N4148	CR4148
CR3	Diode, si, signal, 1N4148	CR4148
MP1	(2) Screw, nylon, 2-56 x 3/8	H4206A
MP2	(2) Nut, nylon, 2-56	H42000
Q1	Transistor, npn, 2N4123	Q41230
Q2	Transistor, pnp, 2N4125	Q41250
Q3	Transistor, npn, 2N4123	Q41230
Q4	Transistor, pnp, 2N4125	Q41250
Q5	Transistor, npn, 2N4123	Q41230
Q6	Transistor, pnp, 2N4125	Q41250
Q7	Transistor, npn, 2N1613	Q16130
R1	Res, comp, 22K, 5%, 1/4W	R20223
R2	Res, comp, 1.5K, 5%, 1/4W	R20152
R3	Res, comp, 680Ω, 5%, 1/4W	R20681
R4	Res, comp, 560Ω, 5%, 1/4W	R20561
R5	Res, comp, 270Ω, 5%, 1/4W	R20471
R6	Res, comp, 4.7K, 5%, 1/4W	R20472
R7	Res, comp, 10K, 5%, 1/4W	R20103
R8	Res, comp, 1K, 5%, 1/4W	R20102
R9	Res, comp, 470Ω, 5%, 1/4W	R20471
R10	Res, comp, 2.7K, 5%, 1/4W	R20272
R11	Res, comp, 2.2K, 5%, 1/4W	R20222
R12	Res, comp, 22K, 5%, 1/4W	R20223
R13	Res, comp, 10K, 5%, 1/4W	R20103
R14	Res, comp, 22K, 5%, 1/4W	R20223
R15	Res, comp, 1K, 5%, 1/4W	R20102
R16	Pot, trim, pc, 10K	R88103
R17	Res, comp, 22K, 5%, 1/4W	R20223
VR1	Diode, zener, 6.8V, 5%, 400 mW, 1N754A	VR7540

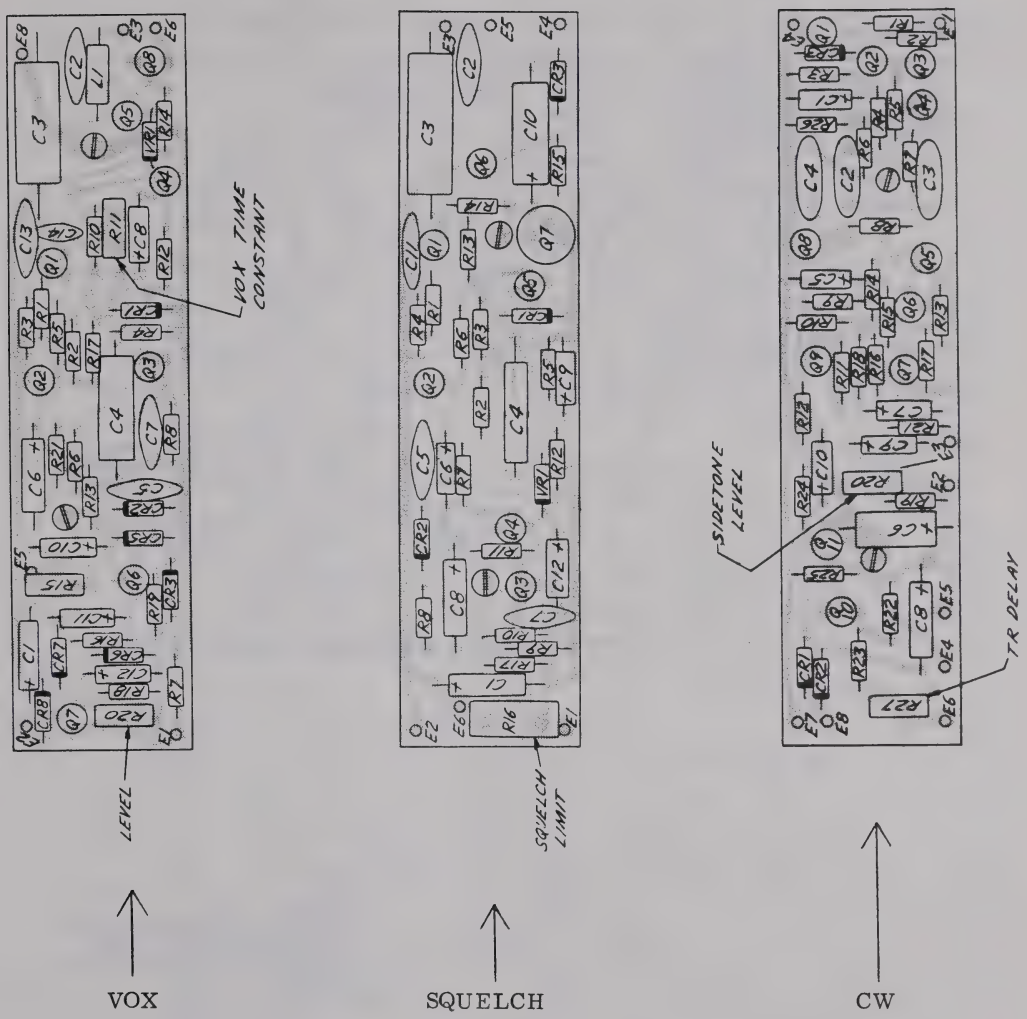
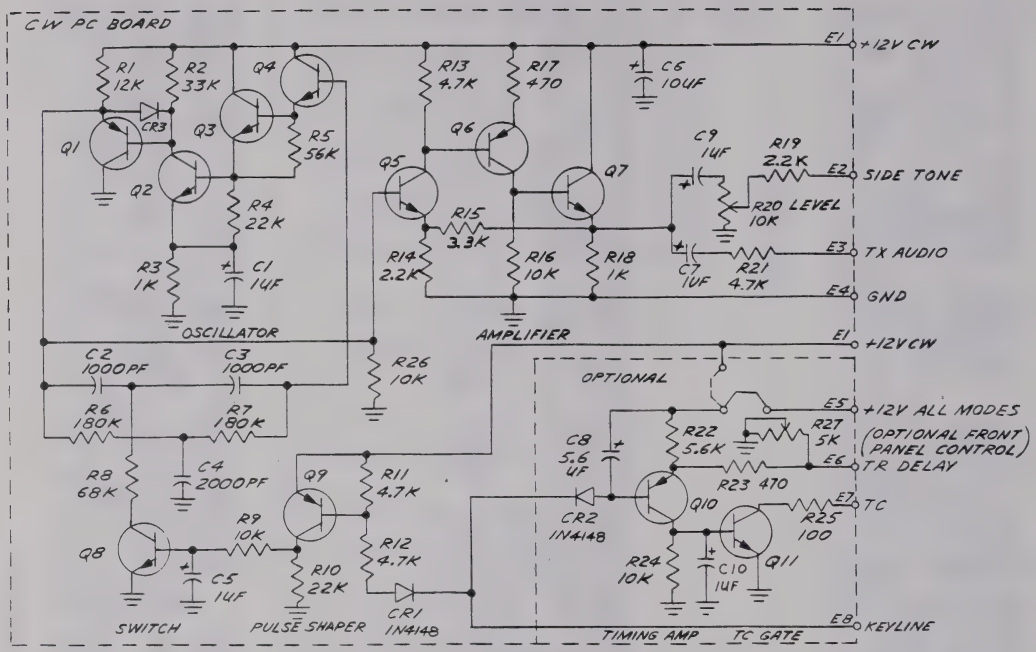


Figure 14-1. Vox, Squelch, and CW PC Board Assemblies



NOTES:
1. UNLESS OTHERWISE SPECIFIED:
   RESISTANCES ARE IN OHMS
   RESISTORS ARE 1/4W 5% CARBON
   TRANSISTORS ARE
   PNP – 2N4125
   NPN – 2N4123

Figure 14-2. CW PC Board Assembly A7A1, Schematic Diagram

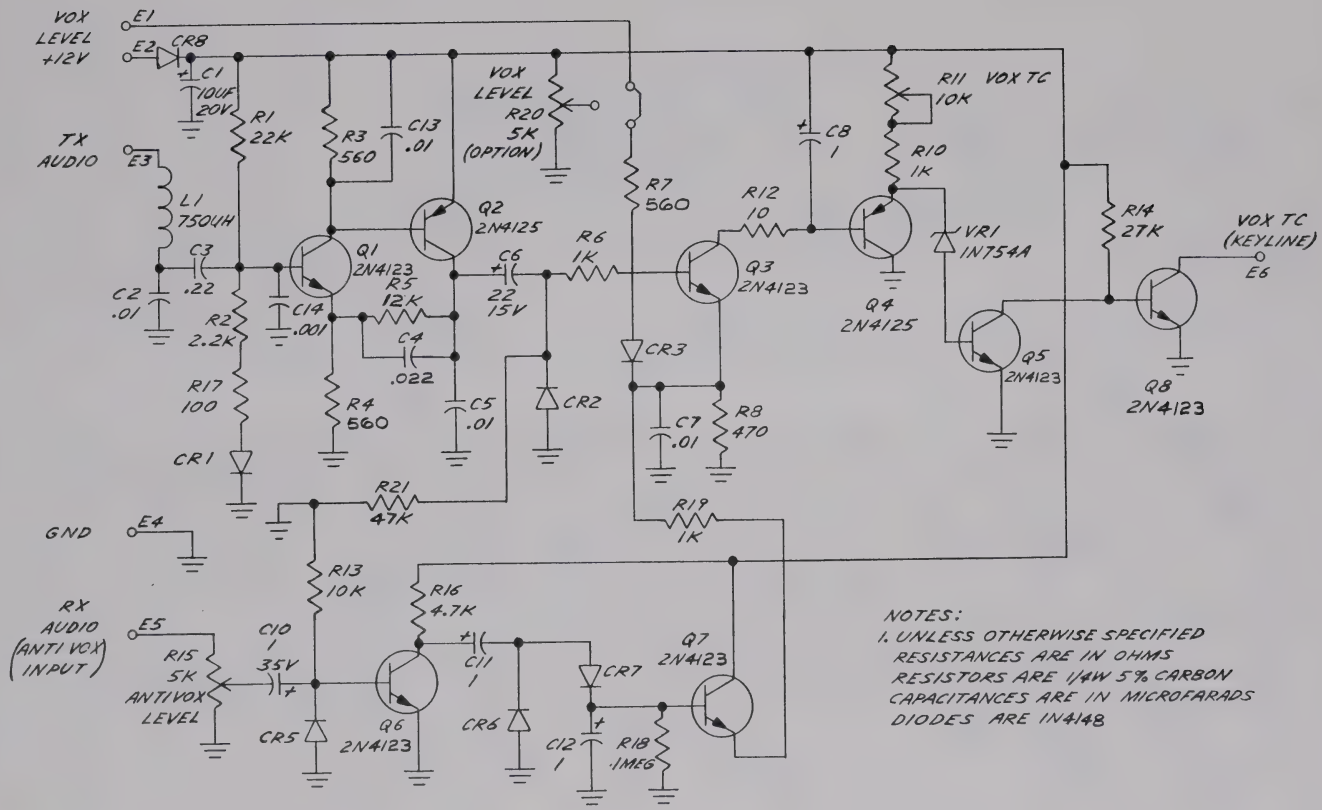


Figure 14-3. VOX PC Board A7A2, Schematic Diagram

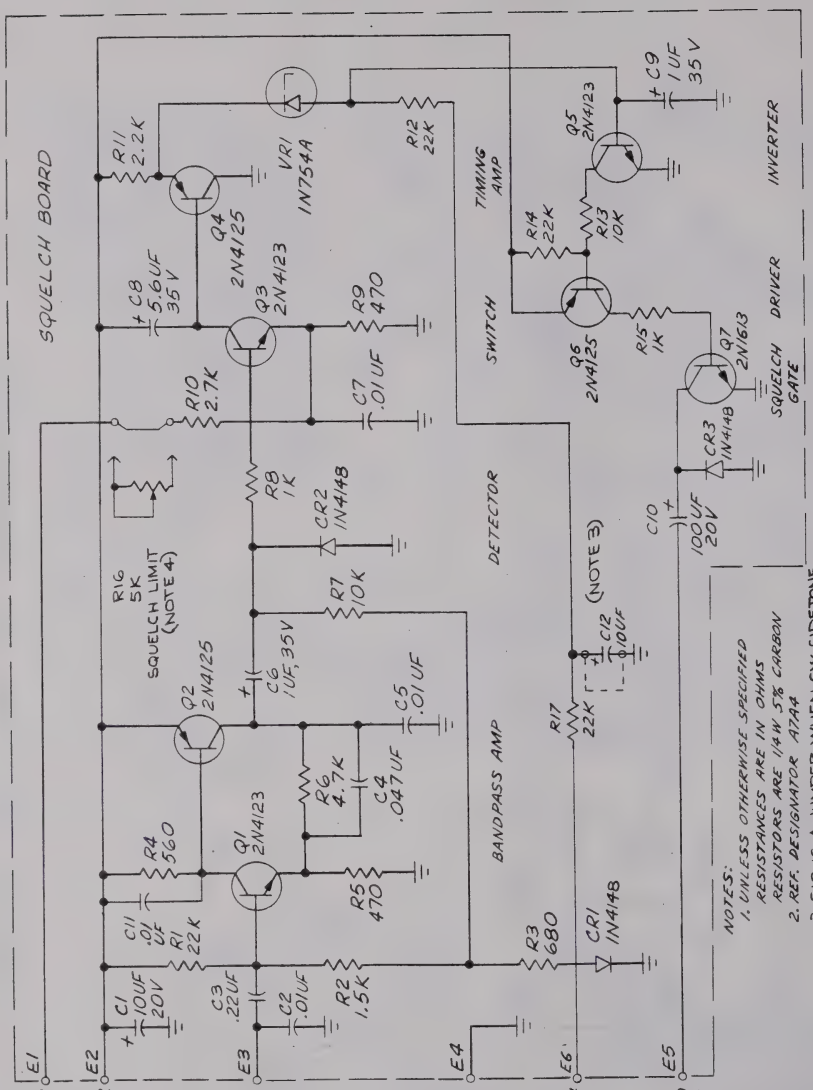


Figure 14-4. Squelch PC Board A7A4, Schematic Diagram

SR SYSTEMS

Scientific Radio Systems, Inc.

SR-206 and SR-210

HF SSB TRANSCEIVER

for Base Station, Mobile or Marine Use

The SR-200 Series of Transceivers represent the ultimate in commercial radio communication equipment. Solid state devices including integrated circuits are used in all low level stages and throughout except for the power amplifier and the receiver front end. For a completely solid state receiver section, a modular FET amplifier directly replaces the tube as an option.

Modular plug-in printed wiring board construction is used throughout to permit easy service or change of channel frequency in the field.

Circuit design of the SR-200 Series Transceivers is such that burn-out due to high receiver input voltages or short or open circuits at the transmitter output is virtually impossible.

Modes of operation are A3H, A3J, A3A, CW and FSK. In addition A1 and A2 Modes of operation are possible as well as F1 and F2. Models are available as either simplex or two-frequency simplex (half duplex). Basically the half duplex equipment is identical to the simplex except that a receive frequency generator module and switching module is included and duplex types of channel cards are used. Note the designation MS and MD are for Type Accepted models for simplex and two-frequency simplex.

FEATURES

- Frequency Range 1.6 to 30 MHz
- Up to 10 channels
- 20 Frequencies with optional Frequency Generator
- Power output 150 watts PEP 100 watts average
- Half Duplex capability available
- Modular construction
- Built-in FSK Keyer/Converter Option
- Built-in Phone Patch (except for Remote)
- Receiver Front End burn-out proof
- Transmitter immune to damage from short or open circuit
- Solid State except for P.A. Section
- Modular power supplies
- AC or DC supplies
- Full line of accessories
- FCC Type Accepted
  Parts 81, 83, 87, 89 and 91
  Models SR-206MS SR-206MD
  SR-210MS SR-210MD

Twenty Frequency operation can be provided by including an additional frequency generator module and "A/B" switch option.

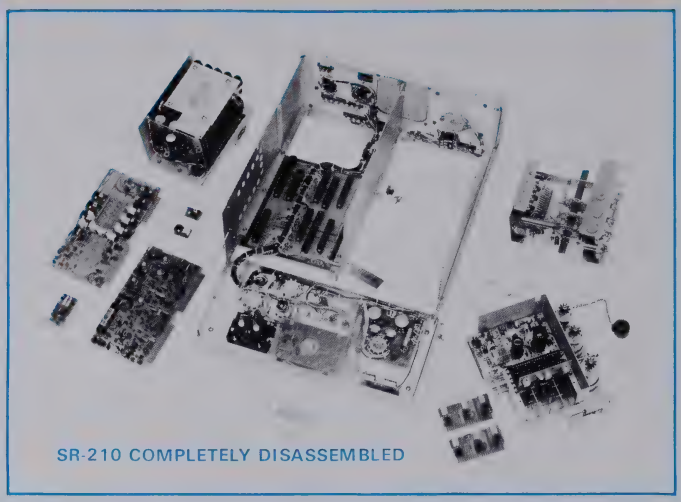
The SR-200 Series Transceivers are designed for continuous duty applications at high average power output including Radio Teletypewriter service and facsimile.

Power output is 150 watts P.E.P. and 100 watts average. Power input is 115/230 volts 47 to 63 Hz single phase or DC (12, 24 or 32 volts).

DISASSEMBLES FAST AND EASY

It is possible to completely disassemble the SR-200 Transceiver in less than one-half hour using only one tool—a Phillips screw-driver.

The SR-200 Series Transceivers break down into six basic functional modules. These are: RF Amplifier, P.A. Matching Network, Frequency Generator, IF-Audio, Power Supply and Main Frame.



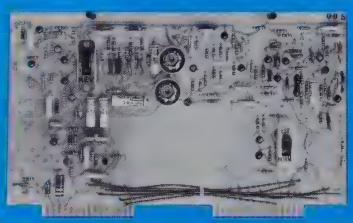
SR-210 COMPLETELY DISASSEMBLED

UNIQUE MODULAR FEATURES

Among the unique features of the SR-206 and SR-210 Transceivers are plug-in printed wiring board options. Among these options are a plug-in printed circuit board FSK Keyer/Converter Module which can be added at any time. The FSK Keyer/Converter Module is available with 2000 Hz Center Frequency and ±425 Hz Shift. Other Shifts and Center Frequencies are available.

A plug-in board accepts VOX, CW and Squelch Modules while the Clarifier Module and Noise Limiter Modules plug into the Frequency Generator Board and IF-Audio Board respectively.

Power Supplies are plug-in and easily removeable.



AR-236
TELETYPEWRITER
KEYER AND
CONVERTER MODULE

AR-260
DC POWER SUPPLY
MODULE

SR-110 1KW
LINEAR AMPLIFIER

LINEAR AMPLIFIER

The SR-110 1KW Linear Amplifier is designed to operate automatically with the SR-200 Series Transceivers. Power Output is 1000 watts PEP and 1000 watts average. Power Input 115/230 Volts 47 - 63 Hz.

REMOTE CONTROL

SR-1601 REMOTE CONTROL

SR-1601 Remote Control is a multi-conductor remote control system for selection of channel, mode, on-off, etc., for an AC operated SR-206 or SR-210. The SR-1601 consists of the Motor Box and the Control Unit.

SR-1602 REMOTE CONTROL

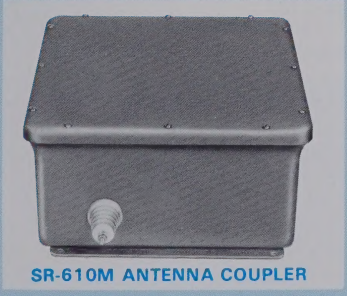
The SR-1602 Remote Control is a multi-conductor remote control which performs the same functions as the SR-1601, but it is used in DC mobile or marine applications.

SR-1650 TELEPHONE LINE REMOTE CONTROL

The SR-1650 can control an SR-200 Series Transceiver over virtually any distance on two telephone pair (one pair optional). Control of Channel, Mode, and Function is provided with Supervisory.

A. SR-1601 REMOTE CONTROL
B. SR-1602 REMOTE CONTROL
C. SR-1650L REMOTE CONTROL
D. SR-1650R REMOTE CONTROL

ANTENNA COUPLER AND ANTENNAS



SR-610M ANTENNA COUPLER

SR-610M AUTOMATIC ANTENNA COUPLER

The SR-610M is a compact antenna coupler in a watertight fibreglass case. It is designed for very stringent environmental conditions such as those encountered on ships or vehicles. Maximum number of channels is 10 and switching is automatically programmed by an SR-200 Series HF SSB Transceiver. The network design ensures excellent efficiency even at the low frequency range with short antennas. Frequency range is 1.6 to 30 MHz and antennas from 9 ft. whips to 150 ft. long wires can be accommodated.

ANTENNA OUTPUT

The SR-200 Series of Transceivers can be ordered with separate output connectors for each channel so that doublet antennas can be used. The standard Transceivers have a single output connector and should be used with a broad band antenna or the SR-610M antenna coupler.

ANTENNAS

AR-247	Doublet Antenna Kit
AR-248	75 Foot Long Wire Kit
AR-249	150 Foot Long Wire Kit
AR-264	Vertical 25 Foot Fibreglass Marine Antenna
AR-265	Vertical 16 Foot Aluminum Telescoping Whip
AR-266	Vertical 35 Foot Aluminum Telescoping Whip
AR-267	9 Foot Stainless Steel Whip
AR-268	Vertical 16 Foot Fibreglass Whip
AR-269	Vertical 35 Foot Fibreglass Whip

SPECIFICATIONS

GENERAL

FREQUENCY RANGE	1.6 to 30.0 MHz
SR-206	Up to 6 channels
SR-210	Up to 10 channels
POWER INPUT	350 watts maximum 115/230 volts, 47-63 Hz single phase 12, 24, or 32 volts DC
OPERATING MODES	LSB (A3J), USB (A3J), Compatible AM (A3H), Reduced Carrier (A3A)
OPTIONS	Selectable Sideband, Squelch, Noise Limiter, FSK Keyer/Converter, Voice Clarifier, RF Gain, VOX ,CW
TEMPERATURE RANGE	-30°C to +65°C
SIZE	7¼'' x 16¼'' W x 17'' D including power supply 18.4 cm x 41.3 cm x 43.2 cm
WEIGHT	48 pounds, 21.8 Kg

TRANSMITTER

POWER OUTPUT	150 Watts PEP, 100 watts Average
2nd Harmonic	-40 db (better than -60 db with optional harmonic traps)
UNDESIRED SIDEBAND	-50 db
CARRIER SUPPRESSION	-50 db
INTERMODULATION DISTORTION	-30 db
FREQUENCY STABILITY	1 part in 10^{-6}
OUTPUT IMPEDANCE	50 Ohms
PPC AND ALC	Provide compression and prevent damage from improper transmitter loads including short and open circuit.

RECEIVER

SENSITIVITY	SSB 0.5 microvolt for 10 db S+N/N AM 1.5 microvolt for 10 db S+N/N
FREQUENCY STABILITY	1 part in 10^{-6}
BANDWIDTH	2.1 KHz - with 6 to 60 db shape factor of 2.5:1
ANTENNA IMPEDANCE	50 Ohms
AGC	Threshold 2.5 microvolts, fast attack
CIRCUIT	Double conversion superheterodyne
AUDIO OUTPUT	4 watts (speaker) 0 dbm (600 Ohms)

ACCESSORIES

AR-280
INVERTER

POWER SUPPLIES

AR-250	AC Power Supply 115/230 volts 50/60 Hz
AR-250M	AC Power Supply 115 volt sine wave or square wave
AR-260	DC Power Supply 12 or 24 volts DC
AR-280	DC to AC Inverter 12, 24 or 32 volts DC - use with AR-250M

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

OPTIONS - ACCESSORIES

AR-230	Selectable Sideband Module
AR-231	VOX Module
AR-232	CW Module
AR-233	Squelch Module
AR-234	Noise Limiter
AR-236	Teletype Keyer and Converter Module
AR-237	Blower Kit
AR-238	Telegraph Key
AR-239	Clarifier
AR-256	RF Gain
AR-257	Duplex Switching Module
AR-258	Duplex Frequency Generator Board
AR-259A	Bracket Kit
AR-259B	Shock Mount Kit
AR-821	Teletype Loop Power Supply

SR SYSTEMS

Scientific Radio Systems Inc.

367 ORCHARD ST. ■ ROCHESTER, N.Y. 14606
CABLE: SIRAD PHONE: (716) 458-3733
TELEX: 978368

SR-206, 210 (5-77) PRINTED IN U.S.A.

SR-210 Price List

(RT-1058/URC)

SR-210 SSB TRANSCEIVER

Available for operation between 1.6 and 30.0 MHz with up to ten channel and twenty frequency capability. Any of the models listed below may easily be re-channeled or new channels may be added by using a Channel Module Kit. Power output is 150 watts PEP and 100 watts Average as rated for Continuous Commercial Service (CCS). All transceivers contain high stability ovens. Specify either upper or lower sideband operation when ordering, or specify AR-230 Selectable Sideband Module. An AC Power Supply or 12 or 24 volt DC Power Supply must also be ordered with the transceiver. (The power supply plugs into the chassis and becomes an integral part of the transceiver. The AC Power Supply and the DC Power Supply can be interchanged easily.) The AR-280A Inverter should be used with the AR-250M AC Power Supply for both AC and DC operation. It is a separate unit.

Price includes a hand-held microphone, for non-remote control units a built-in 600 ohm line for telephone patch or other usage, and crystals for simplex frequencies. 2.1 kHz nominal bandwidth filter is standard. For TTY operation specify wideband filter and blower kit. One manual is included with each transceiver.

ALL TRANSCEIVERS LISTED BELOW HAVE TEN CHANNEL CAPABILITY

SR-210-1	One Channel	$3,523.00
SR-210-2	Two Channels	$3,688.00
SR-210-3	Three Channels	$3,853.00
SR-210-4	Four Channels	$4,018.00
SR-210-5	Five Channels	$4,183.00
SR-210-6	Six Channels	$4,348.00
SR-210-7	Seven Channels	$4,513.00
SR-210-8	Eight Channels	$4,678.00
SR-210-9	Nine Channels	$4,843.00
SR-210-10	Ten Channels	$5,008.00
	If A/B option is selected, for each frequency over basic ten	ADD $ 40.00

Power Supplies

AR-250B	AC Power Supply 115/230 volts, 50/60 Hz sine wave	$ 535.00
AR-250MB	AC Power Supply, 115 volts, 50/60 Hz sine wave or square wave with Automatic Switchover from AC to DC when used with AR-280A	$ 670.00
AR-250MBE	Same as AR-250MB above except 230 volt input	$ 670.00
AR-260B	DC Power Supply, 12 or 24 volts DC (specify voltage)	$ 840.00
AR-280A	12 or 24 VDC Inverter (specify voltage) to be with AR-250MB or AR-250MBE	$1,050.00

Options

A/B	20 Frequency Option Module (plus extra crystals)	$ 460.00
AR-230	Selectable Sideband Module	$ 55.00
AR-231A	VOX Module	$ 100.00
AR-232A	CW Module	$ 100.00
AR-233A	Squelch Module	$ 100.00
AR-234	Noise Limiter Module	$ 65.00
AR-236	Teletype Keyer & Converter Module (specify carrier and shift frequencies)	$1,095.00
SR-821	Teletype Loop Supply (neutral operation only, 20 or 60 ma)	$ 260.00
AR-281	AM Filter 8 kHz bandwidth 2½ to 1 shape factor (6 to 60 db) in lieu of 12 kHz standard.	$ 50.00
AR-274	Wideband Filter 3 kHz nominal for TTY operation (Supplied instead of narrowband filter in transceiver)	$ 155.00

(prices continued on back)

SR SYSTEMS

Scientific Radio Systems Inc. 367 Orchard Street, Rochester, New York 14606

Cable: SIRAD, Rochester, N.Y. **Telephone:** Area 716 458-3733 **Telex:** 978368

All prices F.O.B. Rochester, N.Y. Prices and specifications subject to change without notice. Printed in U.S.A.

Options (continued)

AR-273	Broadcast Trap	$ 55.00
- - - -	Telephone Patch (600 ohms) - non-remote only	NO EXTRA CHARGE
AR-237	Blower Kit (for Teletype operation) AC only	$ 85.00
AR-237DC	Blower Kit DC	$ 250.00
AR-238	Telegraph Key	$ 25.00
AR-239	Clarifier Module	$ 65.00
AR-256	RF Gain Control	$ 20.00
AR-270	Multiple Outputs - non-remote only - Up to *SIX* maximum - per channel add	$ 25.00 each
—	Remote Control Capability (when SR-1600 Series Remote not ordered)	$ 155.00

Handsets and Microphones

AR-275	Hand-Held Dynamic Microphone	$ 100.00
AR-240	Desk Type Dynamic Microphone	$ 145.00
AR-241A	Telephone Deskset with Cradle	$ 110.00
AR-241B	Telephone Handset with Hanger	$ 110.00
	(All Handset and Microphone OPTIONS are supplied INSTEAD of standard microphone.)	

Headphones

AR-243	Headphones for private listening	$ 55.00

Mounting Accessories

AR-246	Rack Mounting Kit for 19″ Rack with Chassis Slides	$ 115.00
AR-259	Shockmount Set including Side Brackets	$ 110.00

Channel Module Kits for Additional Channels or Rechanneling

AR-221	Channel Kit for operation between 1.6 and 30.0 MHz less crystal - Specify approximate frequency.	$ 140.00
	The AR-221 Channel Module Kit above is complete except for the channel crystal. See below for crystals.	
CRYSTALS	When ordering crystals, please state OPERATING FREQUENCY desired.	$ 40.00

Spare Parts Kits

AR-210AC/RSK }	Running Spare Parts - Including fuses, lamps, alignment	$ 237.00
AR-210DC/RSK }	tools, tubes	$ 237.00
AR-210AC/DSK }	Depot Spare Parts - Will support 3-5 transceivers for up	$4,257.00
AR-210DC/DSK }	to 5 years.	$4,153.00

PC Board Extenders

AR-276	(22 pin, one pair)	$ 140.00
AR-277	(15 pin, one pair)	$ 120.00
EXTRA MANUALS	For SR-210 SSB Transceiver	$ 45.00

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